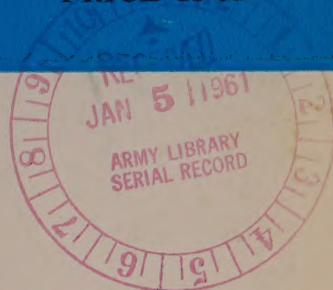


# ELECTRICAL REVIEW

FRIDAY  
DECEMBER 1960

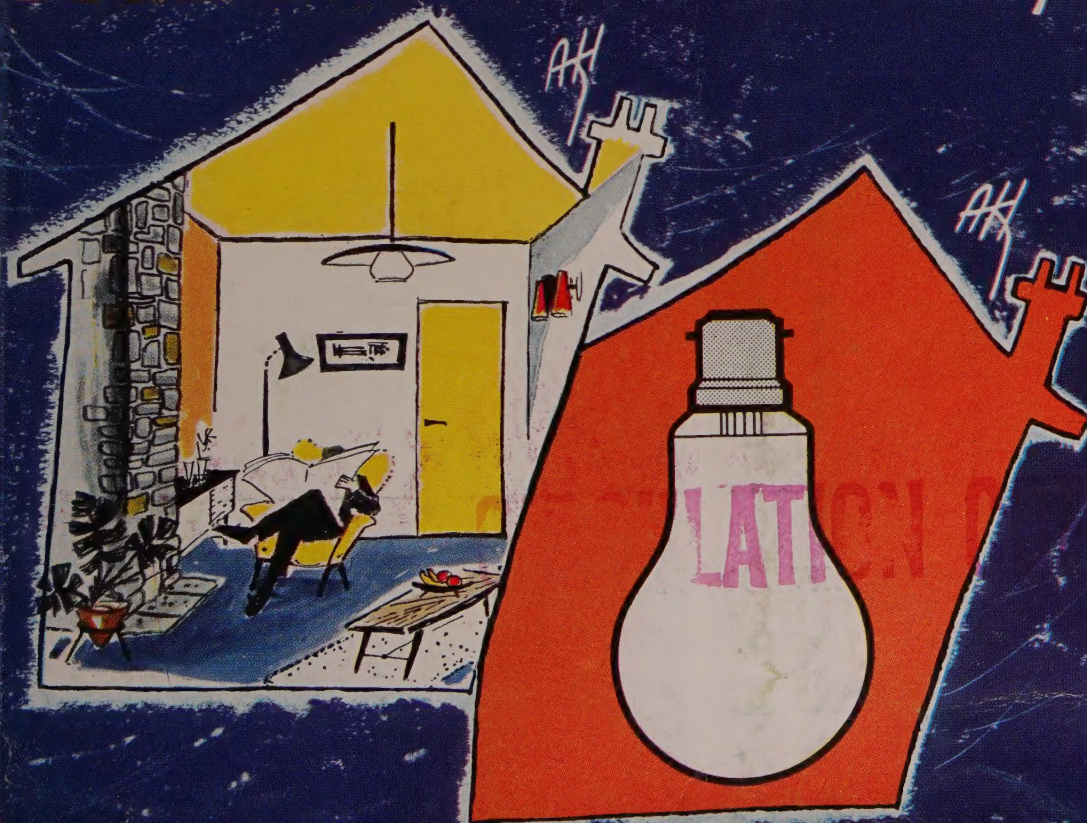
WEEKLY  
PRICE 1s 6d



**Mazda** *the modern lamp for—*

**THE MODERN HOME**

The reliable Mazda GLS lamp has been completely restyled to meet the demands of the modern home. Result: the NETABULB. Netabulbs retain all the proven qualities of the ordinary Mazda lamps, but are more pleasing and compact in shape, and provide the advantages of a Silverlight finish.



MELTON RD LEICESTER

4838

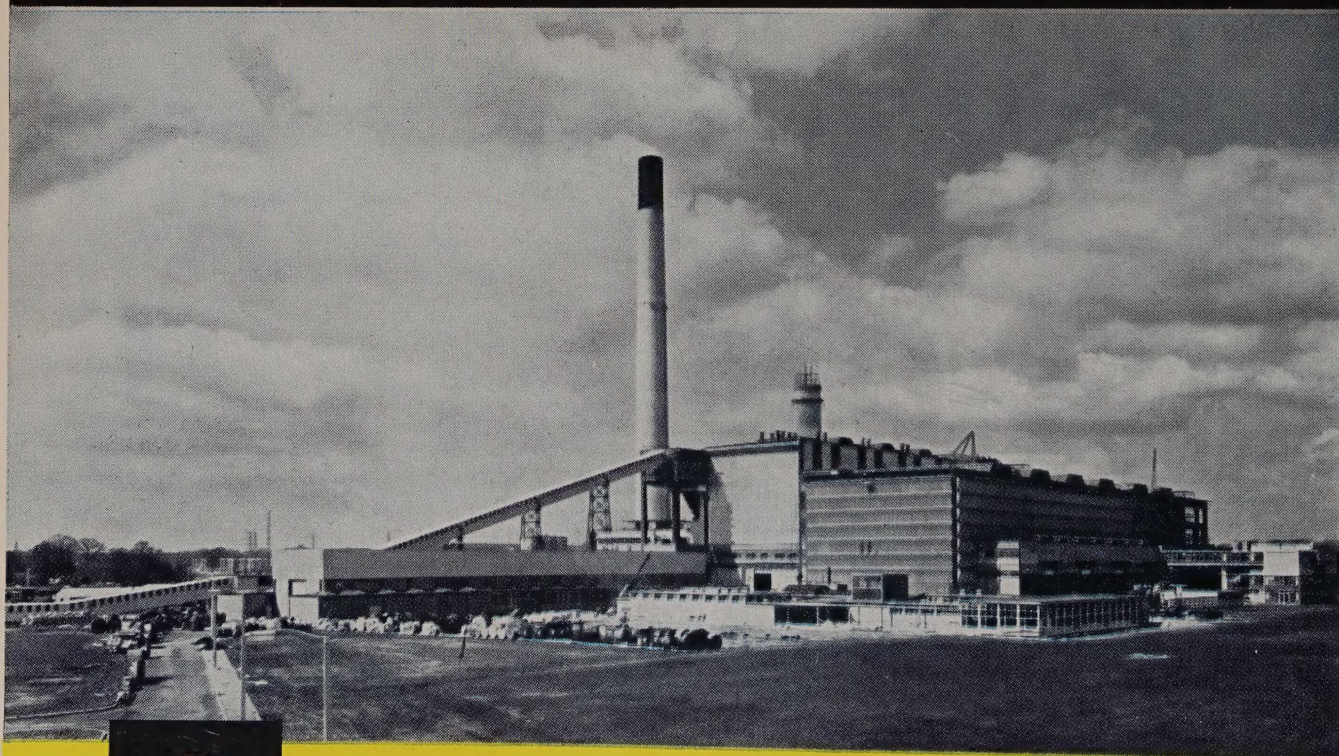


*Nearly*  
**5,000,000**  
*lb per hour*  
**at DRAKELOW 'C'**

On the 900 lb/sq. in. straight cycle this Company has supplied boilers of 30 and 60 MW output to the C.E.G.B. for both coal and oil firing, and they are in successful operation at their Brimsdown, Marchwood, Tilbury and Bold Power Stations.

John Thompson are engaged on the construction of three 120 MW units for operation on the 1,500 lb/sq. in. reheat cycle at the C.E.G.B.'s Richborough Power Station, and are now executing an order for two 350 MW units for operation on the 2,300 lb/sq. in. reheat cycle at the C.E.G.B.'s Drakelow 'C' Power Station; these units will be pulverised fuel fired, each producing 2,450,000 lb/hr., with live and reheat steam temperatures of 1,055°F.

Proof indeed of the confidence of the Central Electricity Generating Board in the ability of the John Thompson Group to design, manufacture, erect and commission power station steam generating plant.



**JOHN THOMPSON WATER TUBE BOILERS LIMITED · WOLVERHAMPTON**

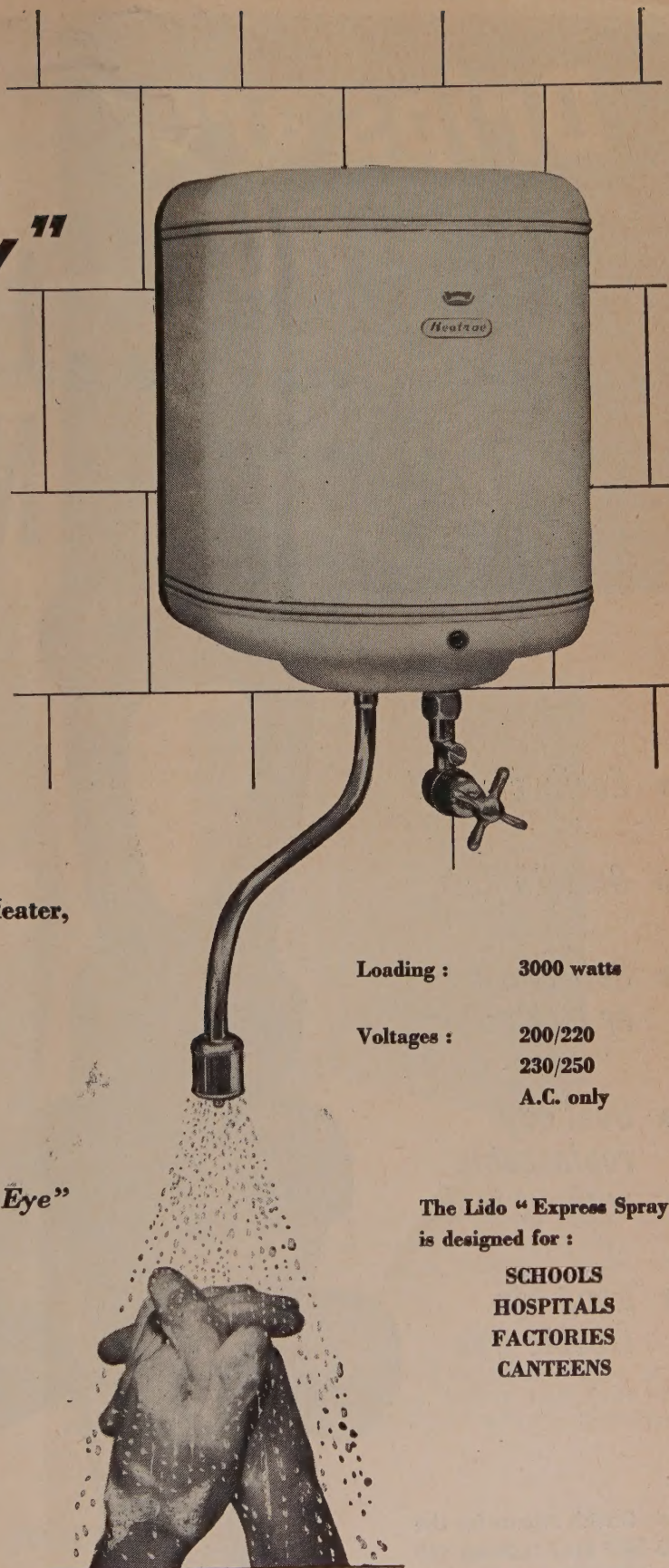


  
**Lido**  
**"Express Spray"**

AUTOMATIC ELECTRIC  
WATER HEATER

**makes light  
work of  
many hands**

Developed from the famous  
Heatrae Lido "Express" Sink Water Heater,  
the "Express Spray" delivers a  
continuous supply of water  
at comfortable hand-washing  
temperature. The heater  
incorporates the exclusive "*Economy-Eye*"  
—visual indication of when  
the current is 'on' and  
proof of low running cost.



Loading : 3000 watts

Voltages : 200/220  
230/250  
A.C. only

The Lido "Express Spray"  
is designed for :

SCHOOLS  
HOSPITALS  
FACTORIES  
CANTEENS

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**HEATRAE LTD**

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***Drips are  
OUT***

— the

**NO-DRIP TAP  
is IN**

- \* *Easily cleaned*
- \* *Smooth flow*
- \* *Self-closing  
or lock open*
- \* *Seat cup  
replaceable  
without tools*
- \* *Long life  
trouble free*



All 'Jackson'  
Counter Sets  
are now fitted  
with the  
**NO-DRIP  
BEVERAGE  
TAP**

**TRADE  
ENQUIRIES  
WELCOMED**

Sole British Agents for the  
**NO-DRIP SELF-CLOSING TAP**  
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**TOMLINSON NO-DRIP FAUCET CO. U.S.A.**

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Showrooms: LONDON (Tel: ABBey 6363) • BIRMINGHAM (Tel: CENTral 2720) • GLASGOW (Tel: CENTral 3660)



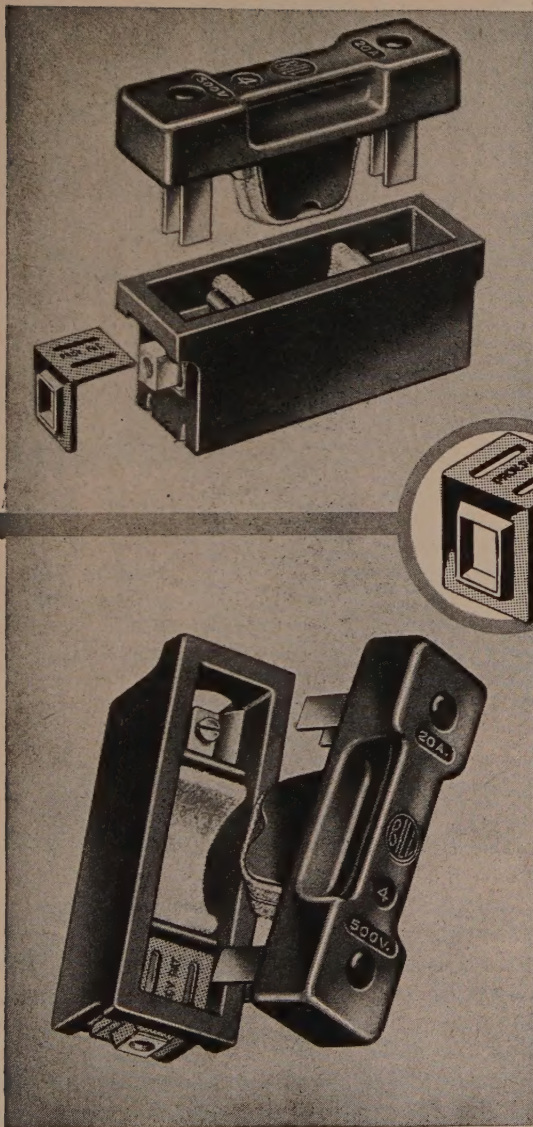


*You cannot buy better gear*

SAFETY

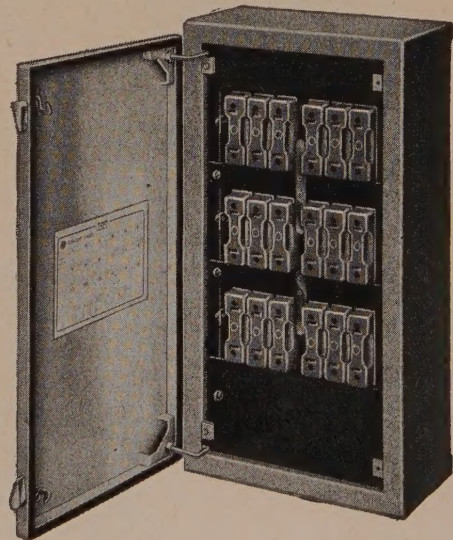


SHIELDS



**BILL** ARC DAMPING TYPE OR H.R.C. DISTRIBUTION FUSEBOARDS ARE NOW FITTED WITH THE **BILL** SAFETY SHIELDS (PROV. PAT.) AS ILLUSTRATED.

FUSEBOARDS ARE AVAILABLE WITH NO PRICE INCREASE IN ALL SIZES OF 15/20 AMP. AND 30 AMP. RATINGS.



THE INTRODUCTION OF PROTECTIVE SHIELDS FITTED OVER THE LIVE CONTACT ENDS IN THE FUSE BASES GIVES ADEQUATE PROTECTION AGAINST ACCIDENTAL CONTACT WHEN THE FUSE CARRIERS ARE WITHDRAWN.

THE SHIELDS ARE STRONG DURABLE MOULDED NYLON AND FORM AN INTEGRAL PART OF THE BUSBAR FUSE CONTACT ASSEMBLY AND CANNOT ACCIDENTALLY BECOME DETACHED.

**BILL SWITCHGEAR LTD**  
**BIRMINGHAM-20**

|                                                                                  |                                                          |                                                 |                                               |                                           |                                                                |                                       |                                                                                |                                             |                                          |
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|----------------------------------------------------------------------------------|----------------------------------------------------------|-------------------------------------------------|-----------------------------------------------|-------------------------------------------|----------------------------------------------------------------|---------------------------------------|--------------------------------------------------------------------------------|---------------------------------------------|------------------------------------------|



Watertight pattern  
surface mounting  
2 CSU/W  
"Start"—"Stop"

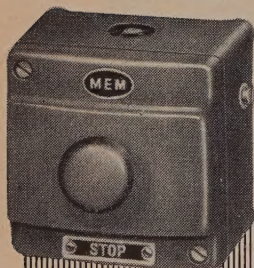
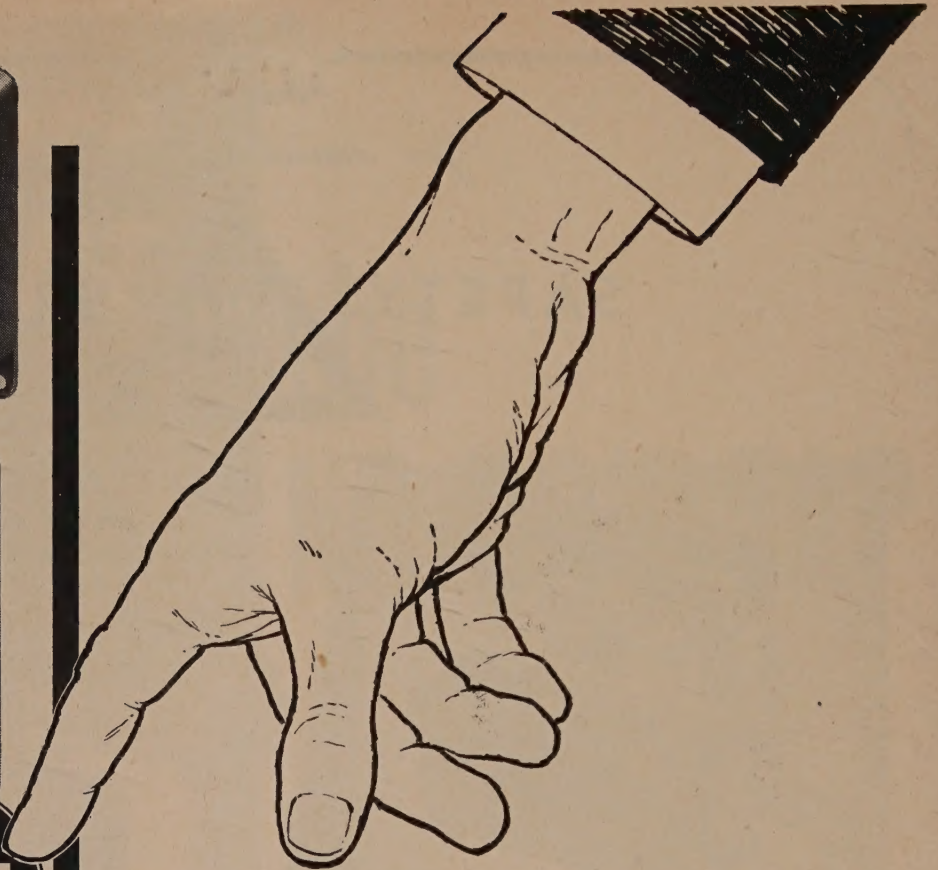


Watertight pattern  
surface mounting  
3 CSU/W  
"Forward"—  
"Reverse"—"Stop"

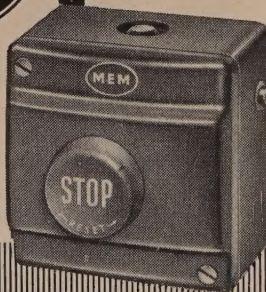


**MEM**

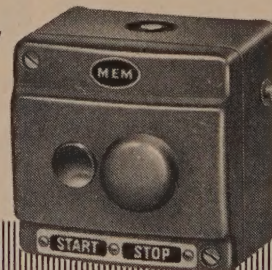
## Push Button Control Stations



Surface mounting  
enclosed pattern  
1 CSU  
"Stop" only



Surface mounting  
enclosed pattern  
1 CSU/L  
Push to  
lock "Off"  
Turn to release



Surface mounting  
enclosed pattern  
2 CSU  
"Start"—"Stop"

Watertight pattern  
surface mounting  
33 CSU/W  
"Start"—  
"Inch"—"Stop"



MEM Push Button Control Stations meet every requirement associated with the remote control of electric motor starters. In addition to the models illustrated, the range includes flush inset patterns for recessing into machine tools, etc., and back entry models for suspension by conduit. Forty different models are available from which to make a choice. A wide range of Control Stations is also available for use on machine tools and other equipment intended for export to Canada. These models are C.S.A. Approved and bear the C.S.A. Approvals No. 13216.

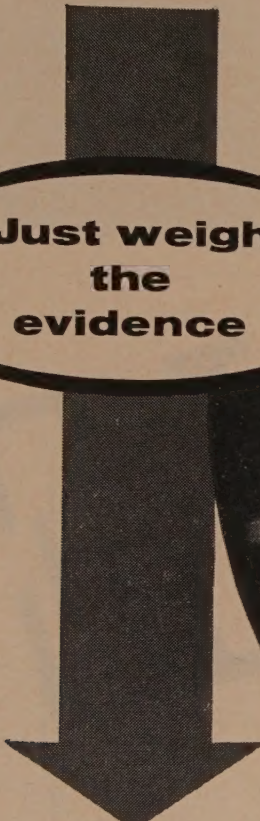
write for List No. 446

**MEM**

MIDLAND ELECTRIC MANUFACTURING CO. LTD., REDDINGS LANE, TYSELEY, BIRMINGHAM 11



# The case for brushless is overwhelming!

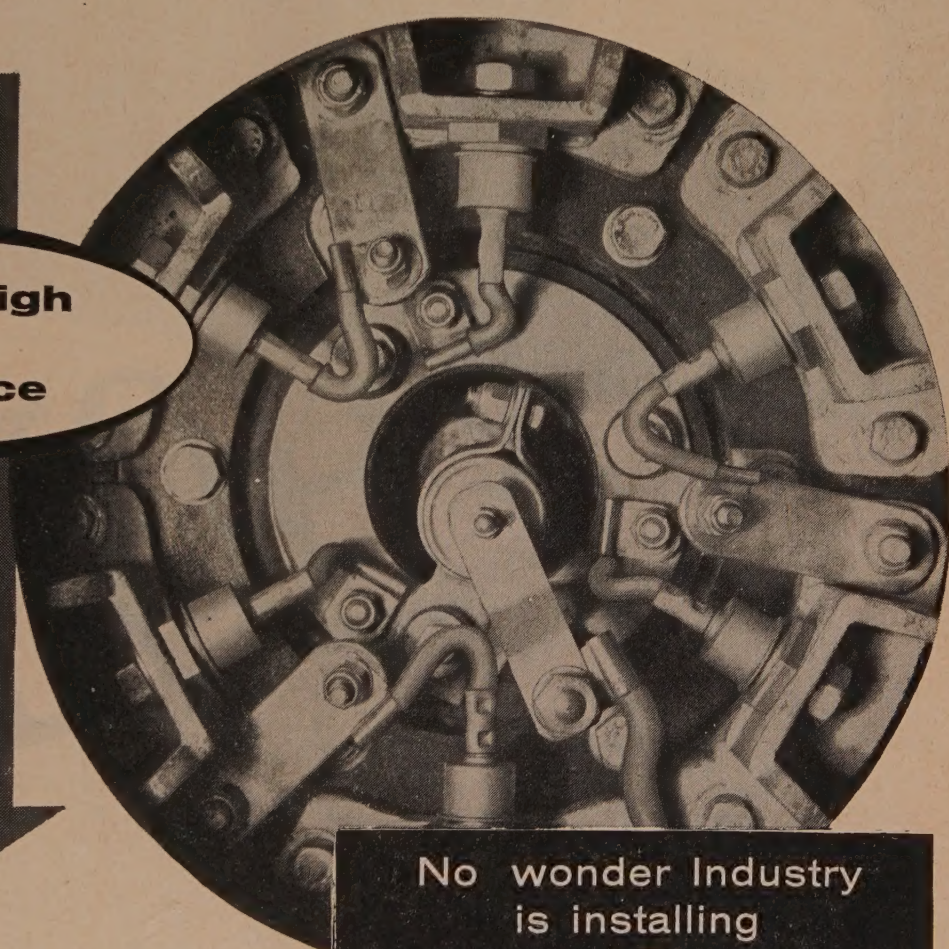


**Just weigh  
the  
evidence**

Maintenance costs cut dramatically . . . because there are *no* brushes to inspect or replace, *no* carbon brush dust to endanger insulation, *no* sliprings to be re-ground, *no* commutator to be skimmed.

Because sparking cannot occur fire risk is inherently low. AEI brushless A.C. generators are particularly useful for standby duty and for service in situations remote from grid supplies.

*Write now for leaflet to:*



**No wonder Industry  
is installing  
AEI  
BRUSHLESS A.C. GENERATORS**

Despite all their advantages brushless A.C. generators cost no more than alternative equipment and are available in an extensive range from 50 kVA up to 5,000 kVA.



**AEI**

**Associated Electrical Industries Limited**  
**Heavy Plant Division**  
RUGBY, ENGLAND

A5583





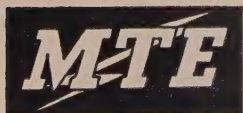
IN  
**A HOLE**

If you are

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for immediate delivery of

CONTACTORS  
OVERLOADS  
ISOLATORS  
RELAYS  
TIMING RELAYS  
PATENT 'MULTI-LOCK'  
TERMINAL BLOCKS



M.T.E. CONTROL GEAR LTD • Leigh-on-Sea • Essex





**Motors need protection too**

**ELLISON STARTERS** give full protection against costly motor burnouts under all conditions

WRITE FOR DETAILS TO GEORGE ELLISON LTD · PERRY BARR · BIRMINGHAM 22B

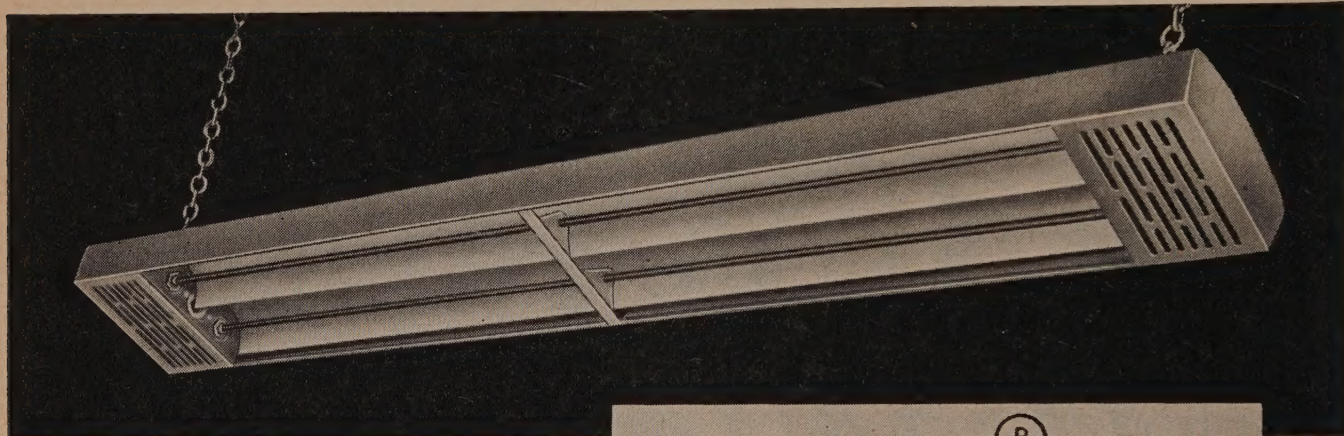


# NEW!

## TWIN-ZONE

# overhead radiant heaters

narrow beam or broad beam from one model

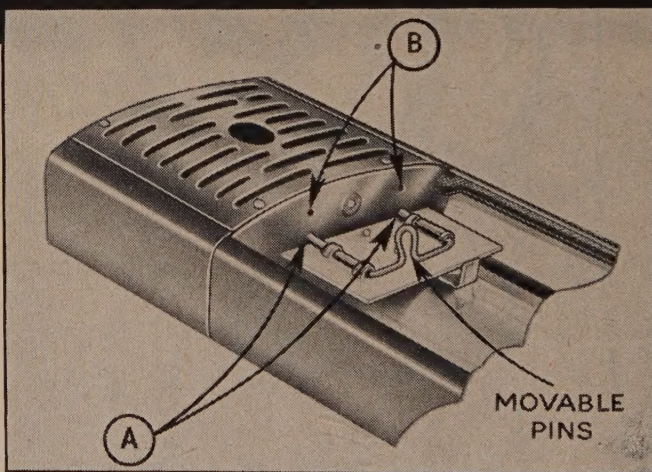


Of entirely new and unique design, these Twin-Zone overhead Radiant Heaters, in  $1\frac{1}{2}$  or 3 kW. loading, will give you more efficient and versatile heating than ever before. New high-density elements, completely safe in use, produce more heat per inch and the polished aluminium reflector radiates it with the maximum effect.

By a simple adjustment of the reflectors, Twin-Zone Radiant Heaters can be preset to give a concentrated or a widespread beam of warmth according to requirement.

Twin-Zone Radiant Heaters are ideal for use in commercial, industrial or public buildings and other premises where only intermittent heating is required or where poor thermal insulation makes overall air heating impracticable. (Not available for domestic use).

- Versatility
- Low Price
- High Efficiency
- Attractive Slim Design
- Long Life 'Safety' Element



**A** Narrow beam position providing concentrated warmth over isolated sections of large buildings such as loading bays, hangers, machine shops and garages.

**B** Broad beam position giving a widespread zone of heat and can be used for complete heating installations in churches, village halls, community centres and similar buildings whether used intermittently or continuously.

**$1\frac{1}{2}$  kW — £8.5.0. (HO 6434)**

**3 kW — £10.0.0. (HO 6435)**

# G.E.C.

The G.E.C. specialises in industrial heating and manufactures every type of appliance. We shall be very pleased to give you free advice on any of your heating problems.

## FOR SPACE HEATING

THE GENERAL ELECTRIC CO. LTD., MAGNET HOUSE, KINGSWAY, LONDON, W.C.2.





Truing the hairspring  
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to ensure linearity  
of scale shape  
requires a dedicated  
hand. It is typical of  
the skill and metic-  
ulous care that goes  
into the making of  
measuring instruments  
by Pullin. First-class  
designing, precision-  
made components,  
precise and delicate  
assembly, accurate  
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Pullin for precision

**M·I·P**

**MEASURING INSTRUMENTS (PULLIN) LTD.**

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London Showrooms: Electrín House, 93-97 New Cavendish Street, London W1. LAngham 4551-6



# Tomorrow's cooker is today's



## ◀ ROTISS-O-MAT SPIT

Newest, most effective way to roast—on a spit, for far better results in far less time. Self-basting to seal in flavour and juices and thereby *end meat shrinkage*. Uses regular oven thermostat settings. May be timed with automatic clock.



## ◀ AUTOMATIC CLOCK

Gives perfect time always as a normal electric clock—and permits completely automatic absentee control of *all* operations . . . oven, Rotiss-O-Mat, Many-go-Round, Therm-O-Guard and Therm-O-Fryer or Deep Well Cooker.

## ▶ THERM-O-GUARD HOTPLATE

Thermostatically controlled hot-plate puts an end to boiling over or burning dry . . . makes any utensil fully automatic. Therm-O-Guard may be clock-controlled for absentee operations.



## ▶ HI-LO-MATIC SHELF

Effortless precision for grilling and baking at the turn of an elevator knob outside the oven . . . the shelf can be raised or lowered without opening the oven door or juggling hot racks. The shelf rolls out at a touch.





# sensation!

Throughout 1960 the new range of Moffat Cookers has been featured at exhibitions and on showroom floors throughout the country. Wherever they have been displayed they have become the unchallenged centre of attraction—years ahead in features and styling. The trade has been astounded at the flood of enquiries—at the number of housewives who are now planning to become proud owners of Moffat cookers. The new Moffat range offers new, exclusive features—and housewives today recognise their supreme value in cooking convenience. The new Moffat is a sensational success—tomorrow's cooker for today's homes!

*A complete range of models is available in 24", 30" and 40" sizes, as well as built-in ovens and surface units.*

*On top or in the oven . . . Fastest-ever heating in an electric cooker!*



# MOFFAT

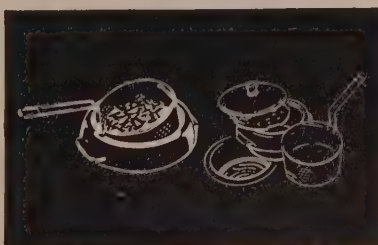


## ◀ ROAST METER

Another brilliant innovation. Just dial your preference for any type of meat (rare, medium or well done) . . . insert the electric meat thermometer probe . . . and a buzzer signals when the roast is done to perfection.

## GIANT OVEN & WINDOW ▶

The Moffat oven is twice as big as conventional ovens. It has a huge non-fogging picture window and interior light. Economical to use, it preheats to 350° in as little as 4 minutes—fastest-ever heating in an electric cooker!



## ▲ DEEP WELL COOKER

The multi-purpose deep well cooker can be used for boiling, steaming, baking, frying . . . all temperature-controlled, all fully automatic—thanks to Therm-O-Guard. The deep fat fryer sinks into the cooker top—completely safe and spillproof!

*Moffat franchises are still open in some areas. Trade enquires are invited.*

**TO: MOFFATS LIMITED**  
1 Newman St., London, W.1

I would like to receive further information on Moffat Cookers and the Moffat franchise.

NAME .....

ADDRESS .....

ER2

**MOFFAT**

An Avco of CANADA Company



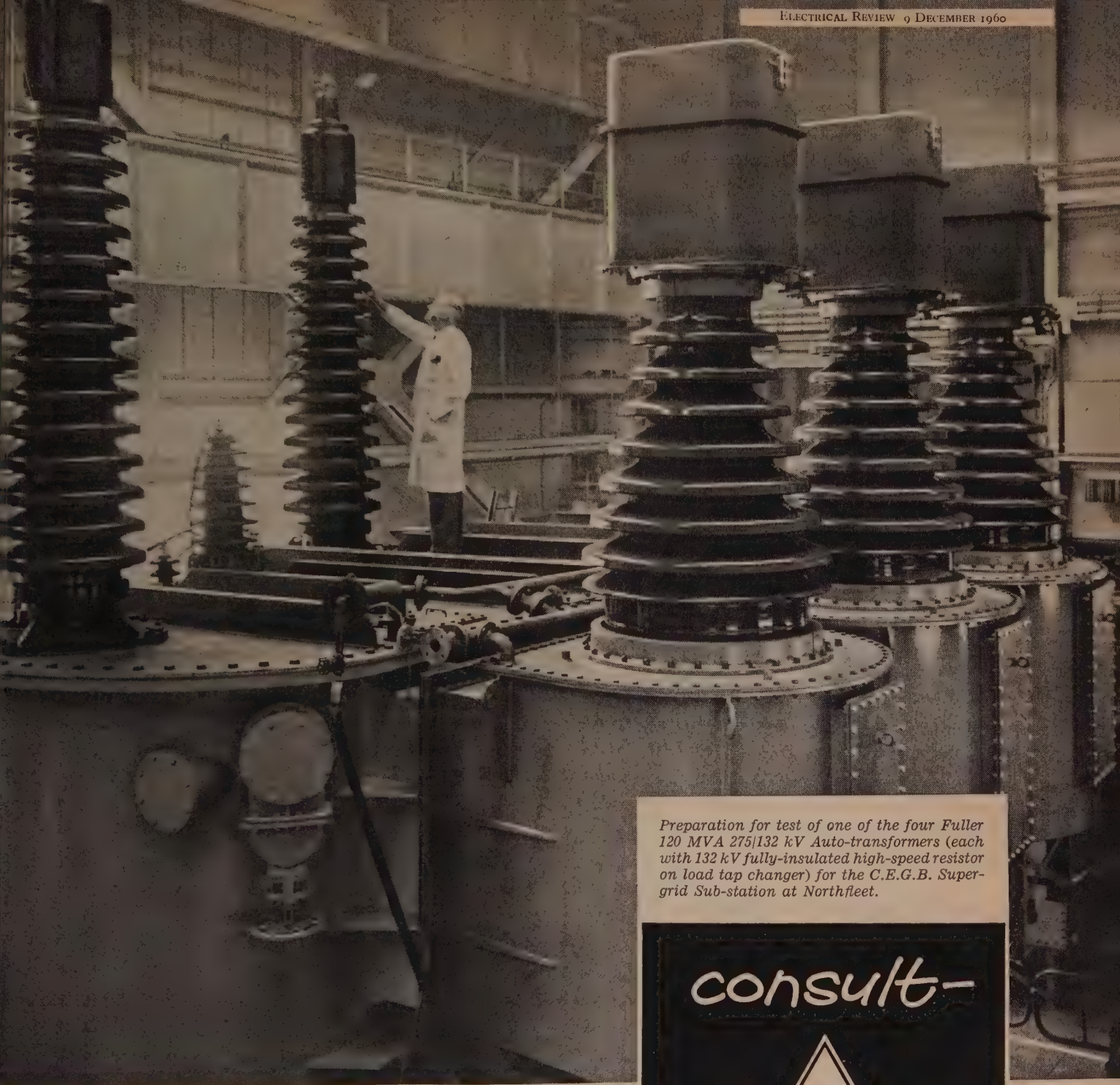


**simply  
a matter  
of  
confidence**

Ask any experienced electrical man. He'll tell you right away that you can have absolute confidence in anything Sanders make. No ifs, buts or doubts. If it's a Sanders job it's the best obtainable and it will never let you down. Take the SANDALINE Fuseboard, for instance, designed to meet today's modern requirements. With its ingenious smooth line case, detachable ends and sides, the 'Sandaline' has easily reversible fusebanks all making for ease and speed of wiring. Rewirable or H.R.C. Fuse Carriers can be fitted at will, since the 'Sandaline' has the tried and proved 'Sandaspeed' Duplex Fuse Units originated by Sanders. Absolutely rigid and dustproof, and incorporating a cylinder type lock with interchangeable keys, the 'Sandaline' Fuseboard is finished in steel-hammered grey stove enamel inside and out. But that's not all. It's a quality job. It's that little bit better than the best. In short, it's a Sanders job.

**SANDERS**





*Preparation for test of one of the four Fuller 120 MVA 275/132 kV Auto-transformers (each with 132 kV fully-insulated high-speed resistor on load tap changer) for the C.E.G.B. Super-grid Sub-station at Northfleet.*

Modern plant and 40 years' experience ensure that we are particularly well-equipped to manufacture transformers up to the largest sizes and the highest voltages. Thanks to our long association with Asea of Sweden, we have access to an unrivalled experience of 380 kV practice. Our up-to-date equipment includes a vacuum drying chamber with a capacity of 7,000 cubic feet suitable for the treatment of the largest units.

consult-



A member of the Hawker Sidddeley Group

Sole U.K. representatives for ASEA Sweden

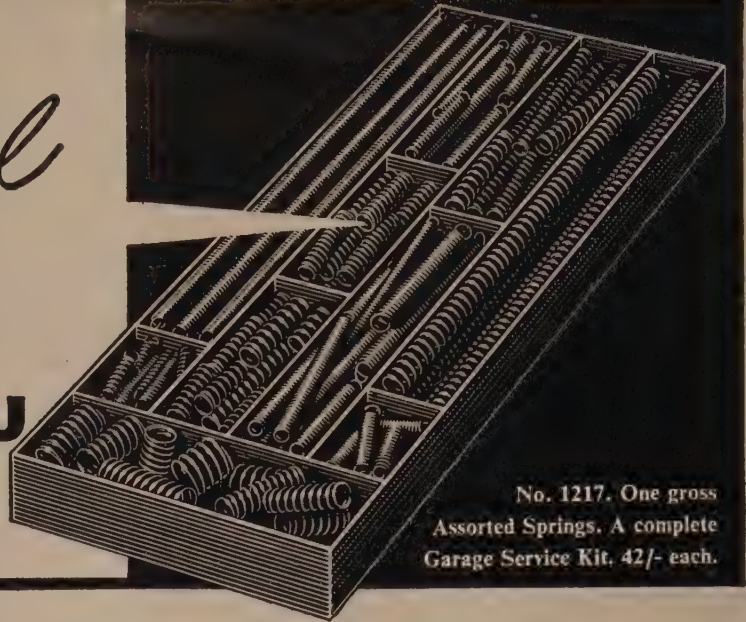
**FULLER ELECTRIC LIMITED**  
FULBOURNE ROAD · LONDON E.17

Telephone: LARKSWOOD 2850

Also at Birmingham, Glasgow and Manchester

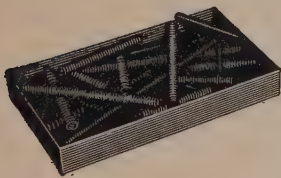


**THAT**  
*Experimental Spring*  
**YOU WANT IS  
 WAITING FOR YOU  
 IN THIS BOX ...**

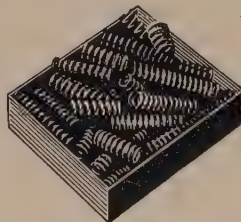


No. 1217. One gross Assorted Springs. A complete Garage Service Kit. 42/- each.

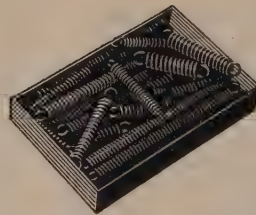
**If not, try another box in the Terry Assorted Springs range**



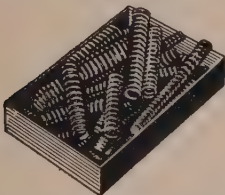
No. 1200. Three dozen Assorted Light Expansion Springs, suitable for carburettor control, etc. 13/6.



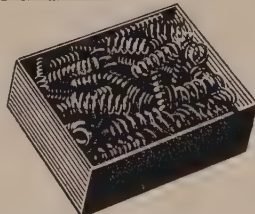
No. 98A. Three dozen Assorted 1" to 4" long,  $\frac{1}{8}$ " to  $\frac{3}{8}$ " diam., 19G to 15G. 5/6.



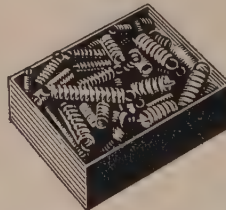
No. 753. Three dozen Assorted Light Expansion  $\frac{1}{4}$ " to  $\frac{3}{8}$ " diam., 2" to 6" long, 22 to 18 S.W.G. 10/6.



No. 760. Three dozen Assorted Light Compression Springs. 1" to 4" long, 22 to 18 S.W.G.,  $\frac{1}{8}$ " to  $\frac{3}{8}$ " diam. 6/6.



No. 757. Extra Light Compression, 1 gross Assorted,  $\frac{1}{8}$ " to  $\frac{3}{8}$ " diam.,  $\frac{1}{2}$ " to 2 $\frac{1}{2}$ " long, 27 to 19 S.W.G. 15/-.



No. 758. Fine Expansion Springs. 1 gross Assorted  $\frac{1}{4}$ " to  $\frac{3}{8}$ " diam.,  $\frac{1}{2}$ " to 2" long, 27 to 20 S.W.G. 15/-.

We know *exactly* how difficult it is to find springs for experimental work . . . we've been making quality springs for over 100 years. So, we confidently offer you our excellent range of small boxed assortments which covers a very wide range. We can only show a *few* boxes. Send us a p.c. for our full list. If ever you are stuck with a spring problem let our Research Department put their long experience at your disposal.

### Have you a Presswork problem?

If so, the help of our Design Staff is yours for the asking.



Really interested in Springs? "Spring Design and Calculations" 9th Edition tells all—post free 12/6.



Cut Production Costs with Terry's Wire CIRCLIPS. We can supply immediately from stock—from  $\frac{1}{8}$ " to  $\frac{3}{8}$ ".



Looking for good Hose Clips? Send for a sample of Terry's Security Worm Drive Hose Clip and price list.

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## for SPRINGS

**HERBERT TERRY  
& SONS LTD**

Redditch, Wores.

(Makers of Quality Springs, Wireforms and Presswork for over 100 years)



# P.T.F.E. winding wires for missile control equipment

The Sperry Gyroscope Company choose BICC P.T.F.E. Winding Wires for miniature coil winding for these reasons:

... they are capable of operating for long periods at very high temperatures

... they afford the best possible space factor

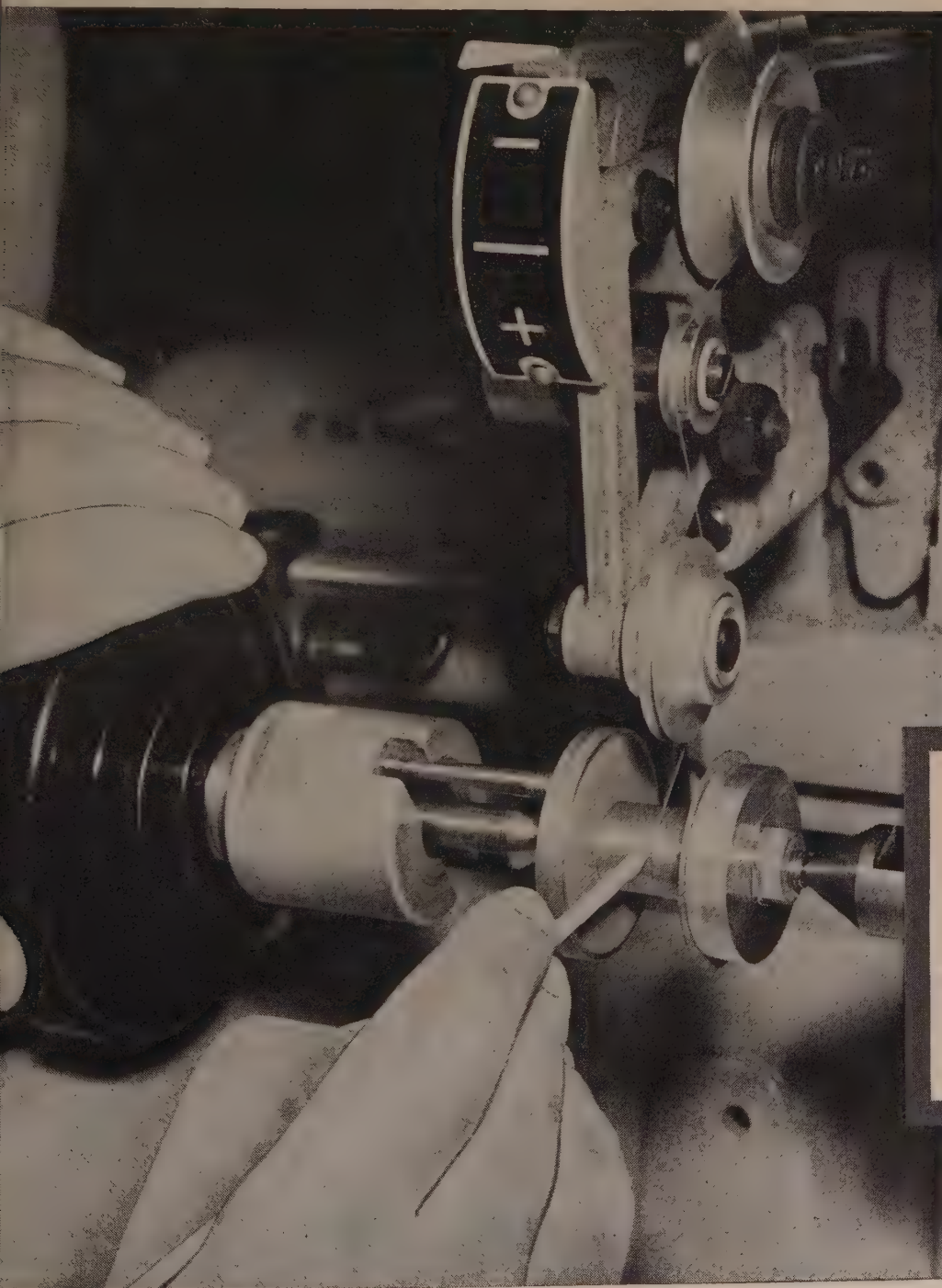
... they are chemically inert

... and they are absolutely reliable—a vital quality in missile control equipment.

P.T.F.E. (polytetrafluoroethylene) has excellent temperature and electrical properties. It will operate up to 250°C, and remains flexible down to extremely low temperatures. The material has a minimum dissipation factor, low dielectric constant, plus high dielectric strength. It has the highest volume and surface resistivity of all insulating materials and its low capacitance means thinner insulation sections—saving space and weight.

*There is a BICC Winding Wire for every application.*

*Further details will be gladly sent on request.*



**BICC**

**P.T.F.E**  
winding wires

*The winding of Sperry coils is closely supervised to ensure optimum compactness.*



**TUNGSTONE BATTERIES** have been selected by British Railways for switchgear operation and supervisory control, in connection with their electrification programmes for the London Midland, Eastern and Scottish Regions.

These Batteries are being used to provide low voltage D.C. supplies for remote supervisory control circuits; for operating switchgear controlling high voltage A.C. supplies from the National Grid, and switchgear at intermediate points along the lines being electrified, to section electrically the overhead track equipment.



*Photograph by permission of British Railways*

## TUNGSTONE BATTERIES

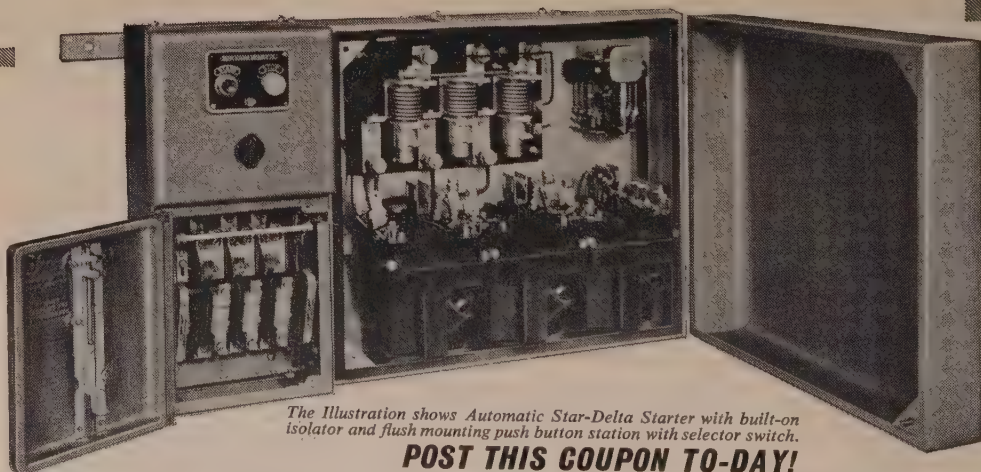
**TUNGSTONE PRODUCTS LTD.,** SALISBURY SQUARE, LONDON, E.C.4. Telephone: LUDgate Circus 0342

Works: MARKET HARBOROUGH, LEICS.

TC23R

## BKS AUTOMATIC STAR-DELTA STARTERS

This range of automatic star-delta starters is suitable for controlling motors up to 55 h.p. on 380/440 volts, three-phase supply, and utilised in their construction are our now famous heavy duty contactors, which are fitted with solid silver contacts, air-break; the solenoid assembly only is oil-immersed, but **NO MAINTENANCE IS REQUIRED.** This unique design prevents contact bounce by controlling the speed of the contact make and break, thereby increasing the contact life considerably. No other contactor has this feature.



*The Illustration shows Automatic Star-Delta Starter with built-on isolator and flush mounting push button station with selector switch.*

**POST THIS COUPON TO-DAY!**

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**GLASGOW:** 73 Robertson Street, Glasgow C.2. Tel: CENTral 2479.  
**NEWCASTLE:** Mr. H. Breeze, 4 Beechwood Avenue, Monkseaton, Whitley Bay, Northumberland. Tel: Whitley Bay 24231.

**WEST MIDLANDS:** 2-3 Graham Street, Birmingham, 1. Tel: CENTral 6693.  
**EAST MIDLANDS:** Mr. D. A. Crossley, 38 St. Mawes Avenue, Wilford, Nottingham. Tel: Nottingham. 89023.

To **BRITISH KLOCKNER SWITCHGEAR LTD. CHERTSEY, SURREY**

Please send me your latest comprehensive catalogue.

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FIRM .....

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# NEW HOTPOINT HALO

It's the fastest on the market!

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**Fastest boiling**—higher loading plus low mass ensures more rapid heating. The Halo boils a pint of water in only 3½ minutes!

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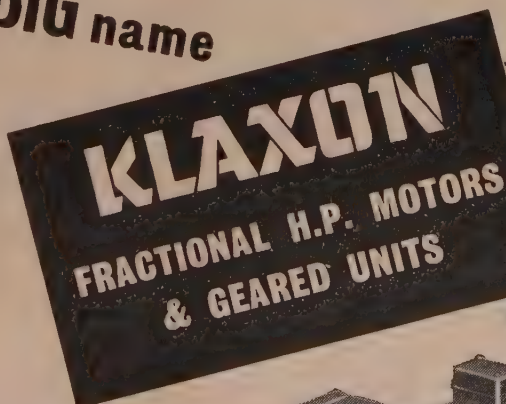
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The Steel Goddess was the description given recently to the new Durgapur steelworks. This was apt not only because of its immense importance to Indian steel, but also because Durgapur means 'the place of Durga' and Durga is the ten-armed Goddess of Bengal. The power behind the annual production of one million ingot tons of steel is one of our many responsibilities at Durgapur. The Goddess's heart, the power plant, consists of four Simon-Carves water-tube boilers producing steam for vital steelworks services; the associated fuel and ash handling plants, cooling system and steam distribution network are all Simon-Carves designed and built.



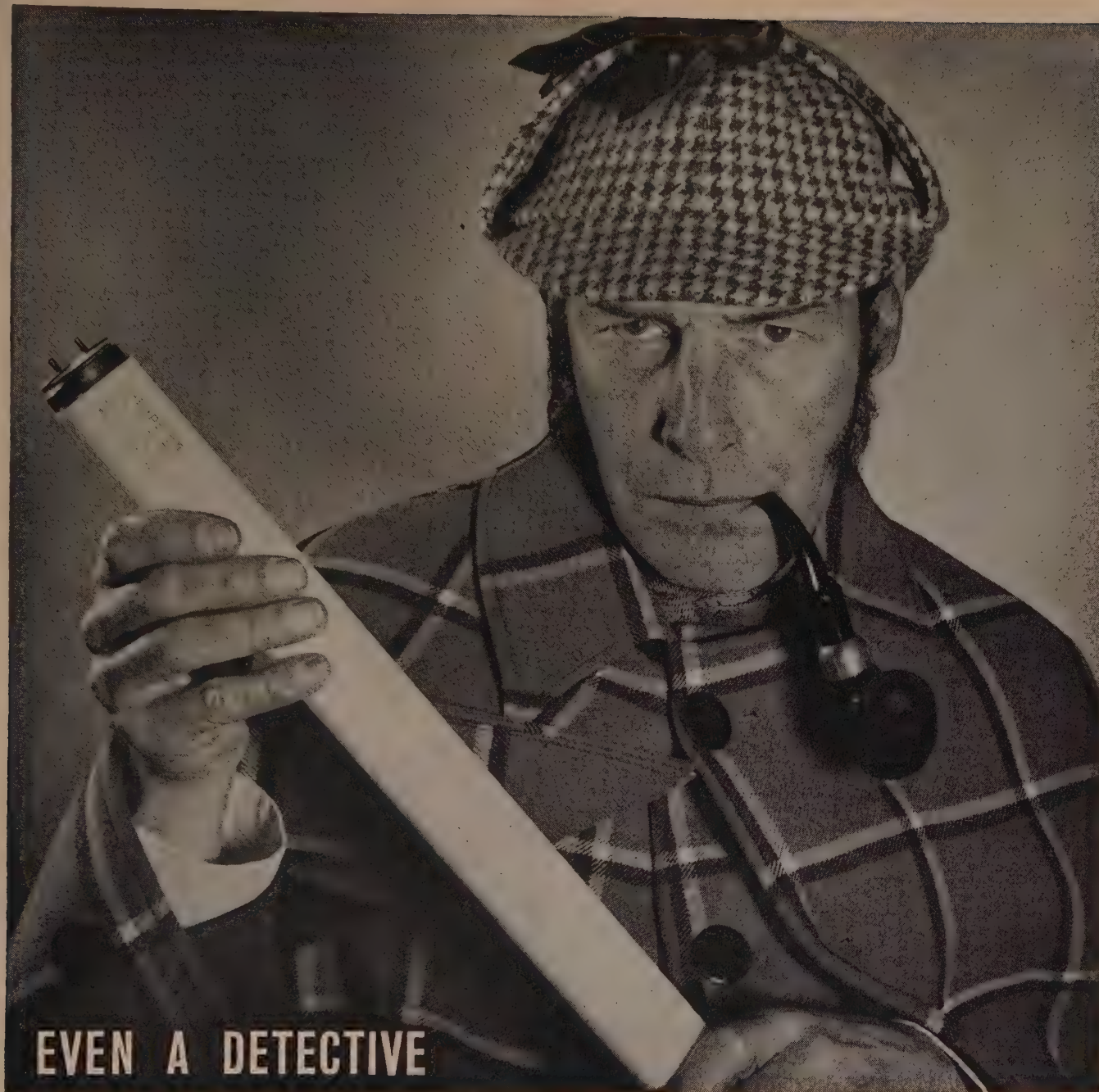
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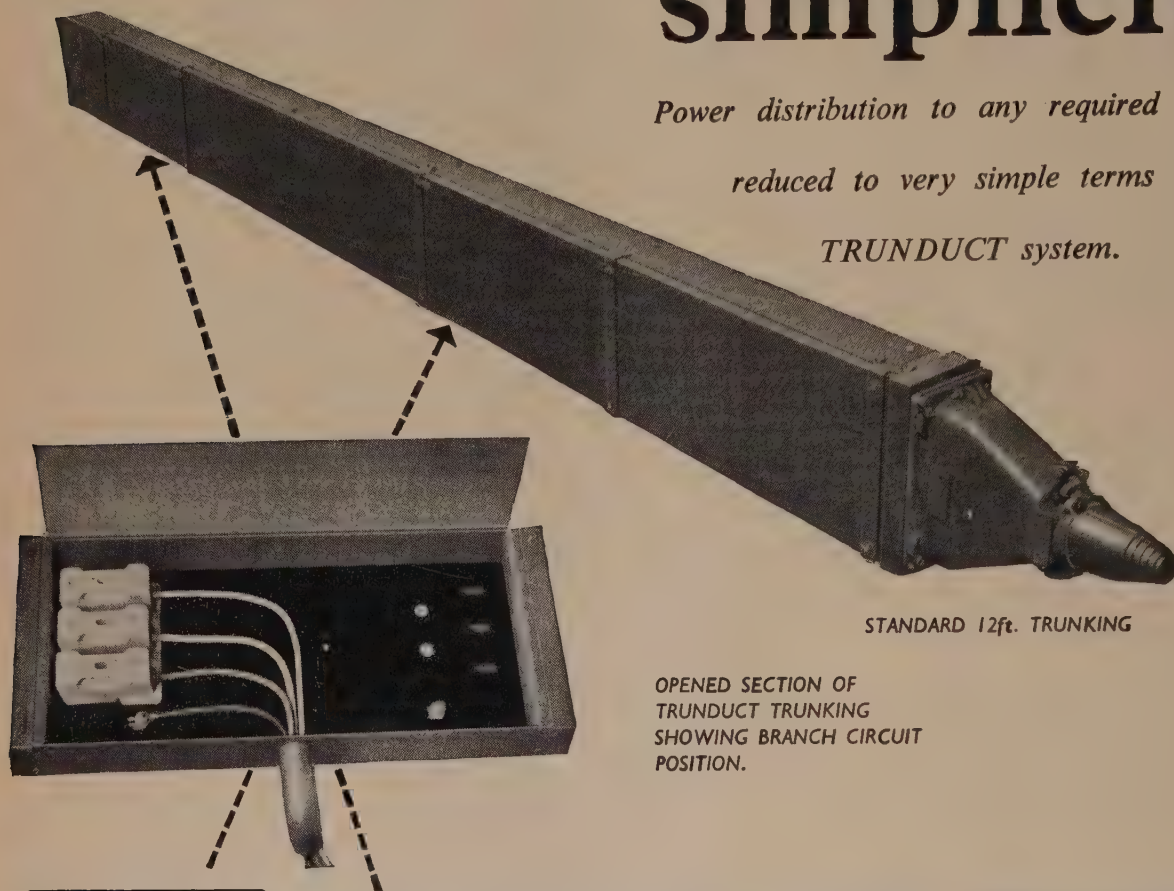
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## He could run a Jag on his print bill...

... not that he's likely to, of course; Suggy's the Bullnose Morris type if ever there was one. I must have told him about our Gestelith a hundred times before the message began to get through. Well, I like old Suggy so I ran him over to my place one day and we watched Stan run off a few pages of the Bulletin. That did it. Two hours later Suggy was in his shirt-sleeves learning the finer points from

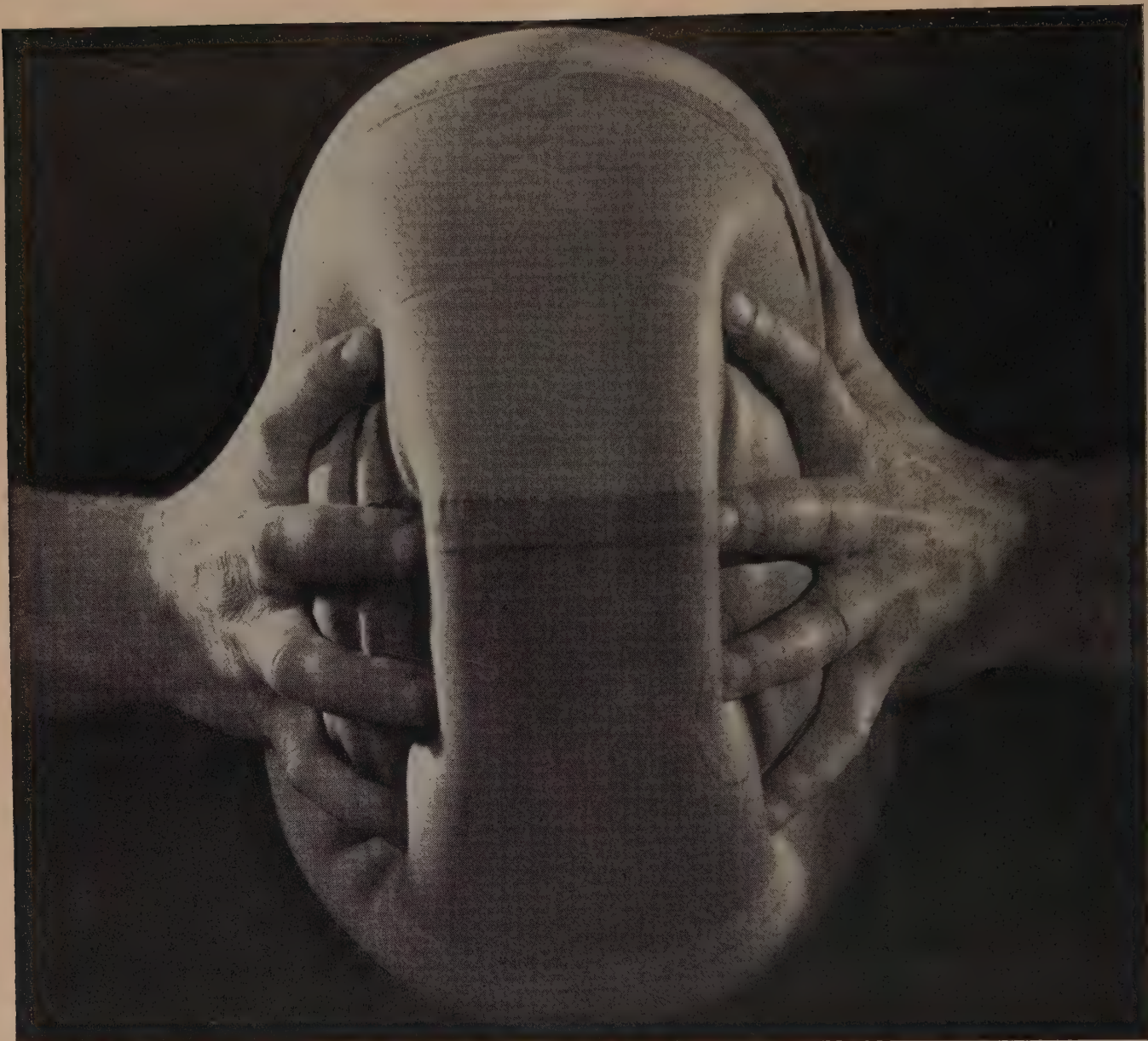
Stan... who's a founder member of the Gestelith fan club... and before the afternoon was up he'd run off a few impressions from a paper plate himself. Borrowed my telephone to arrange a demonstration at Gestelith... Astonishing, isn't it, the way some people'll shut their eyes to progress, then rise to a new idea when you least expect it?

The Gestelith pays for itself as a fast, efficient duplicator (using paper plates typed in your own office) while offering all the potentialities of the most versatile printing process of all... offset lithography. Gestelith is unique in having controls designed on work-study principles, relieving the operator of much purely repetitive work.



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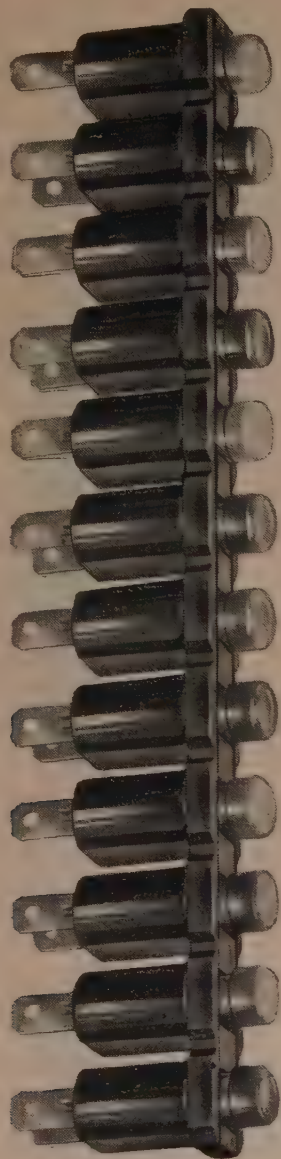
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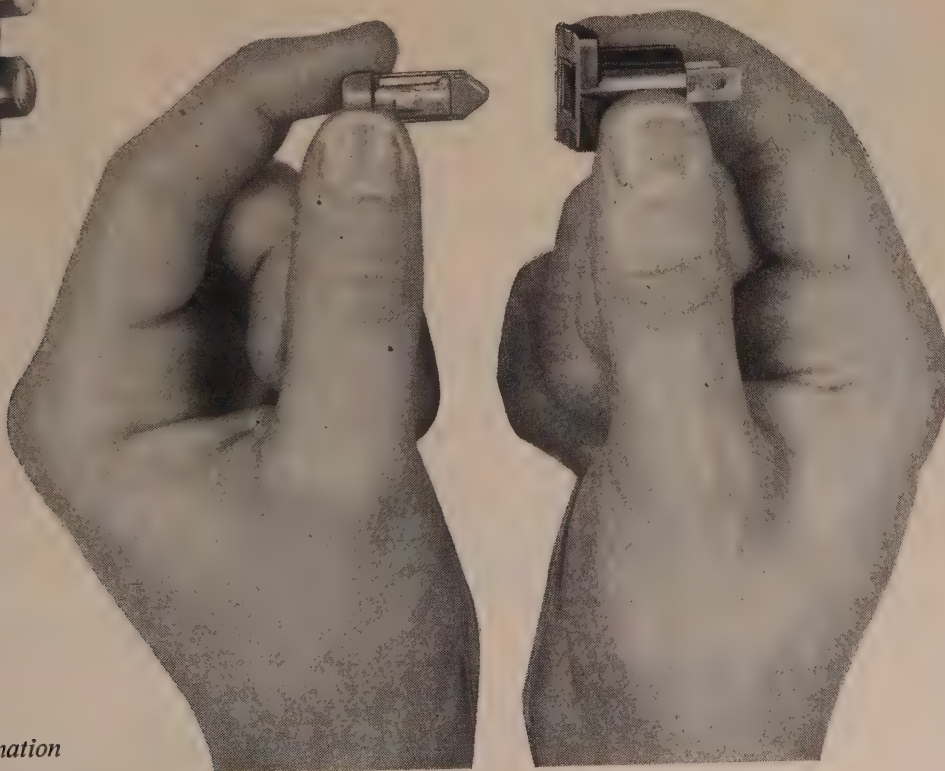
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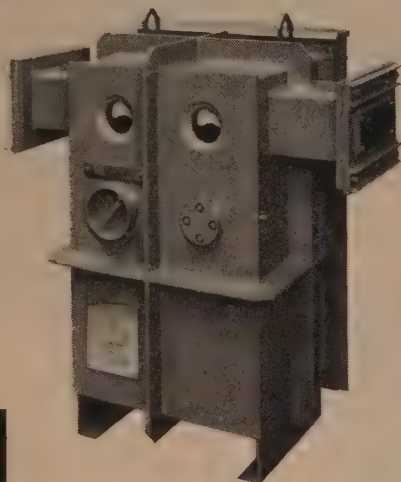
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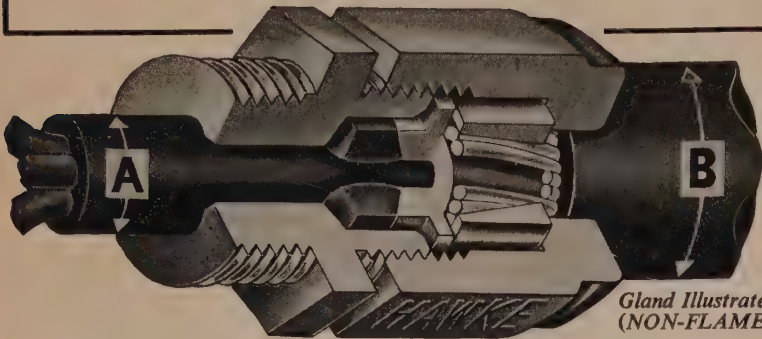
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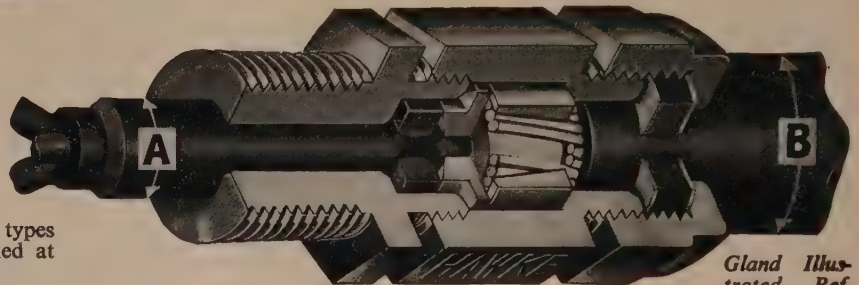
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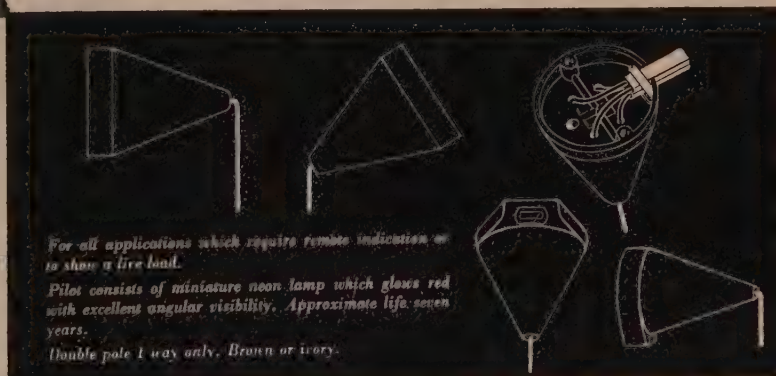
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Patress available to assist compliance with 207G 13th Edition I.E.E. regulations. Patress also supplied with integral looping in terminal.

Operates successfully with cord at any angle up to 90° from vertical.

\* Special cable clamp available for use with surface wiring. Surface knockouts are provided.

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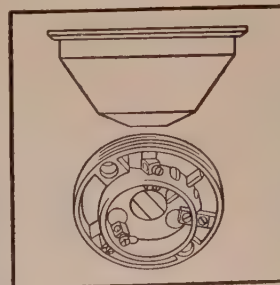


## and FALKS "FLEXCONE" a matching ceiling rose

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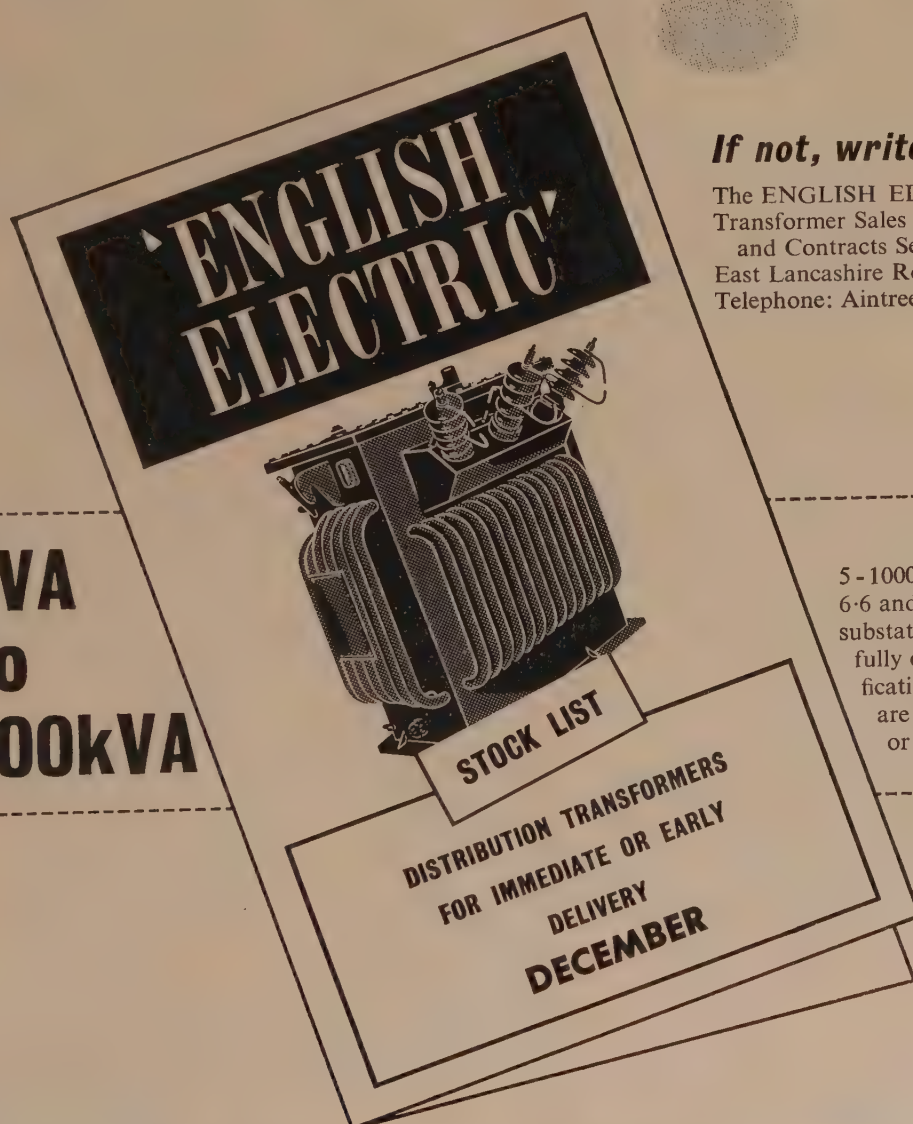
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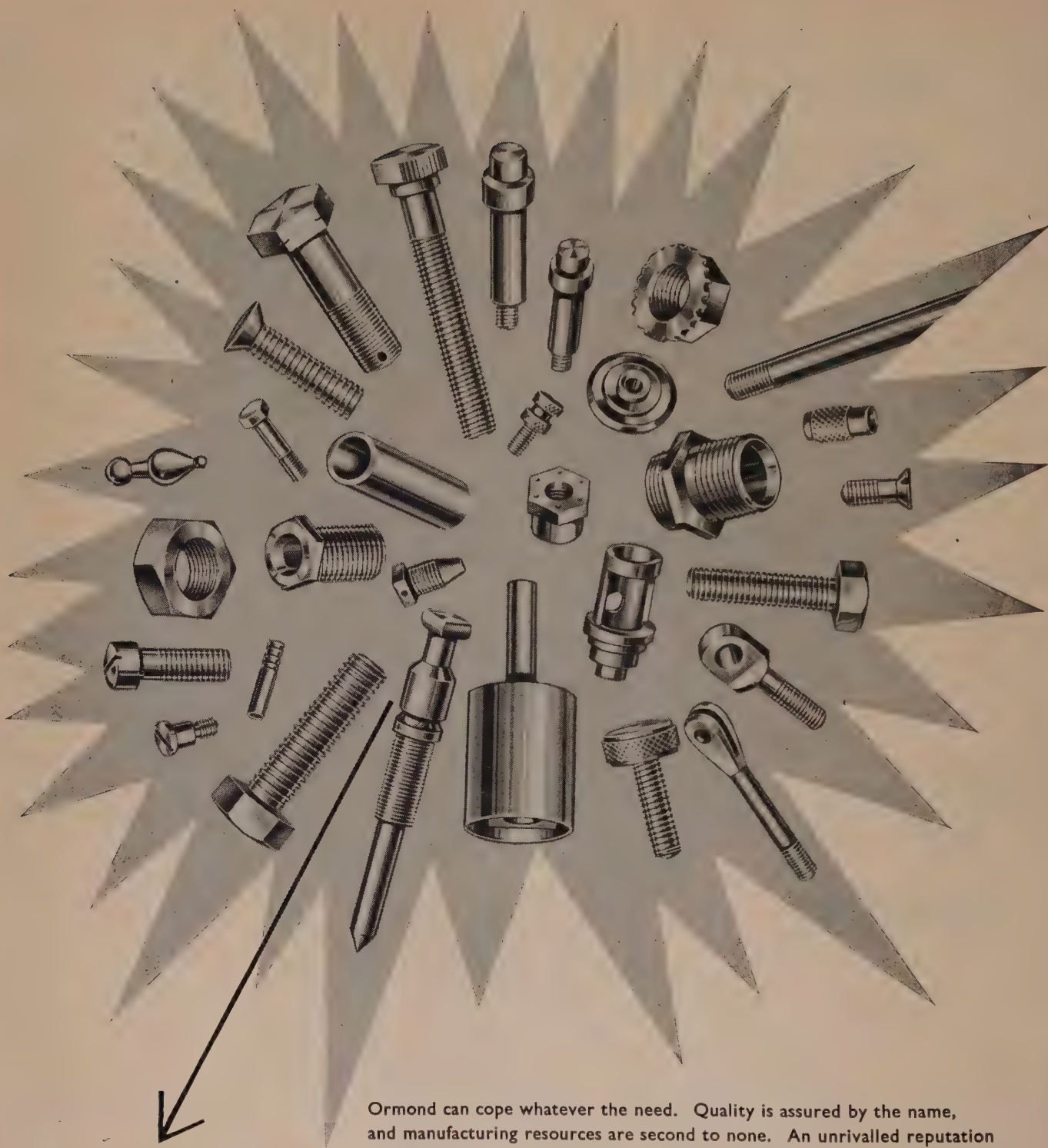
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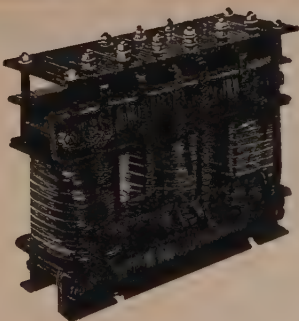
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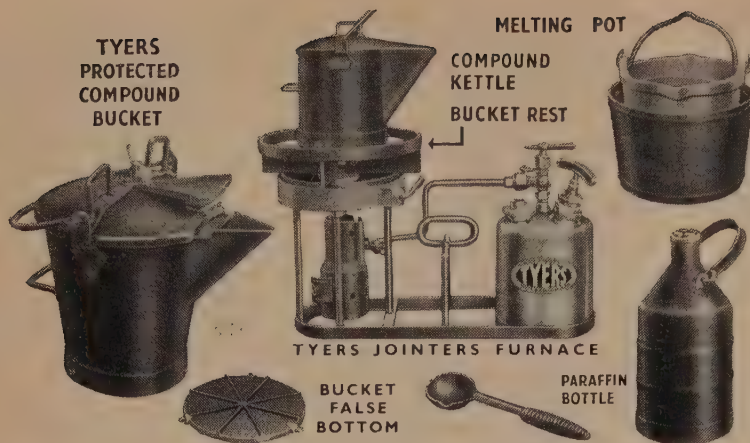
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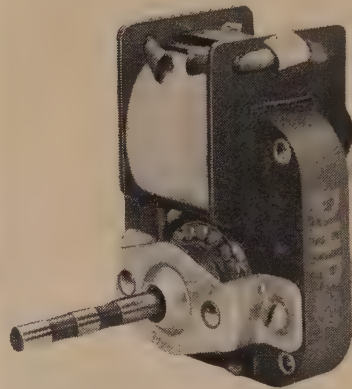
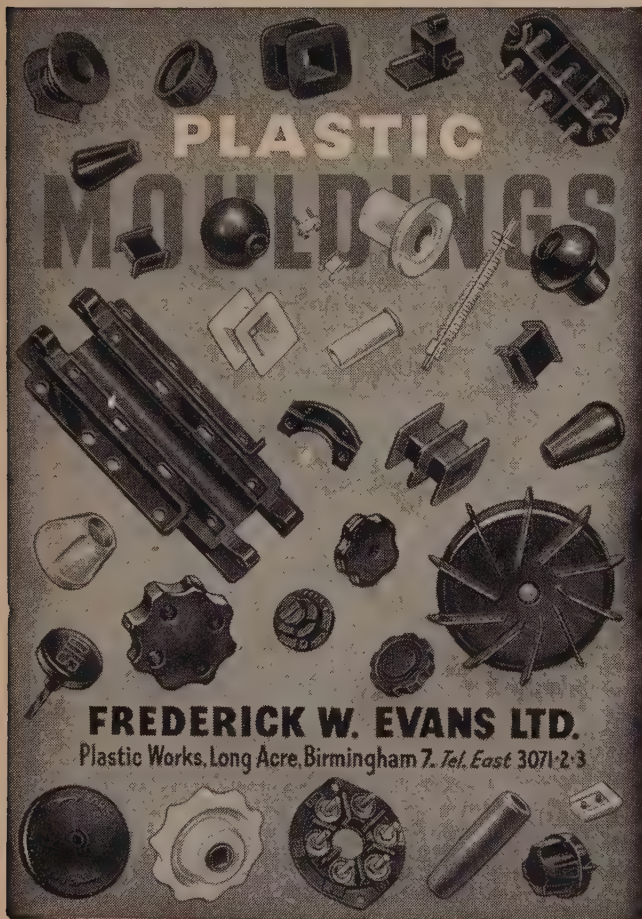




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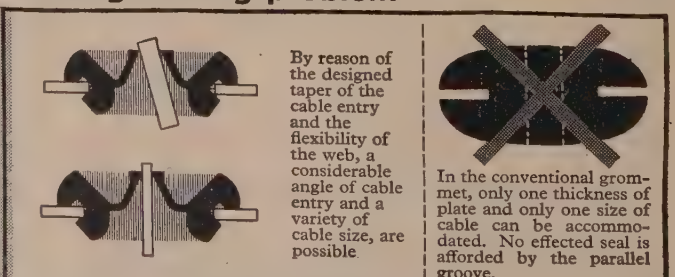
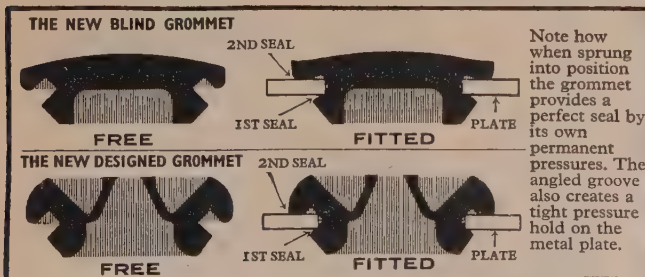
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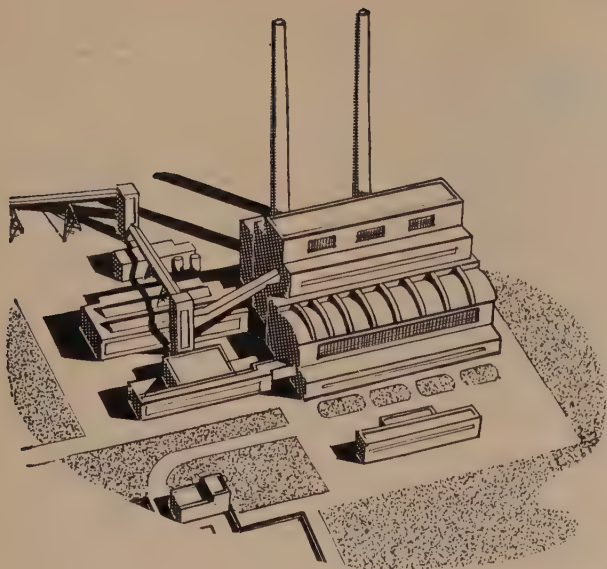
*BICC M.I.N.D. Cables at the North Western Electricity Board's Vernon Park installation, Manchester.*

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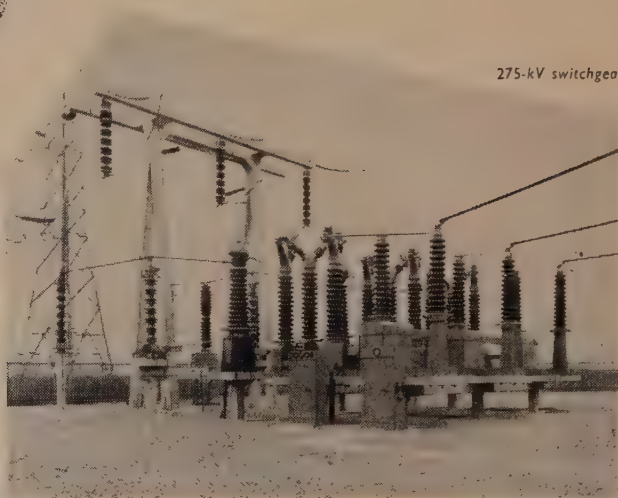
# Blyth A

## GENERATING STATION

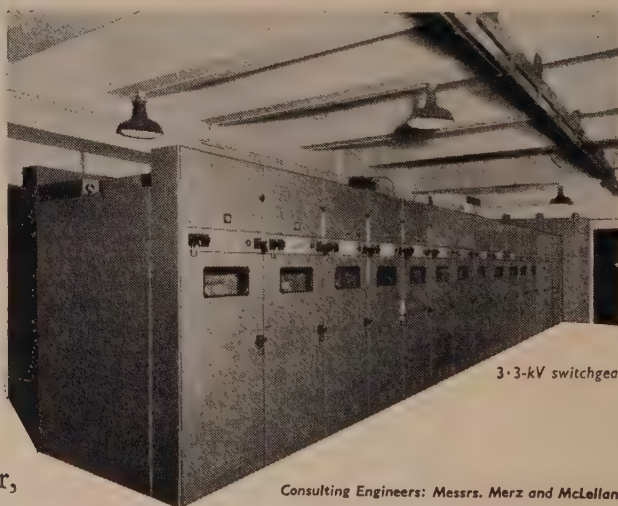


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together with associated  
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*275-kV switchgear*



*3.3-kV switchgear*

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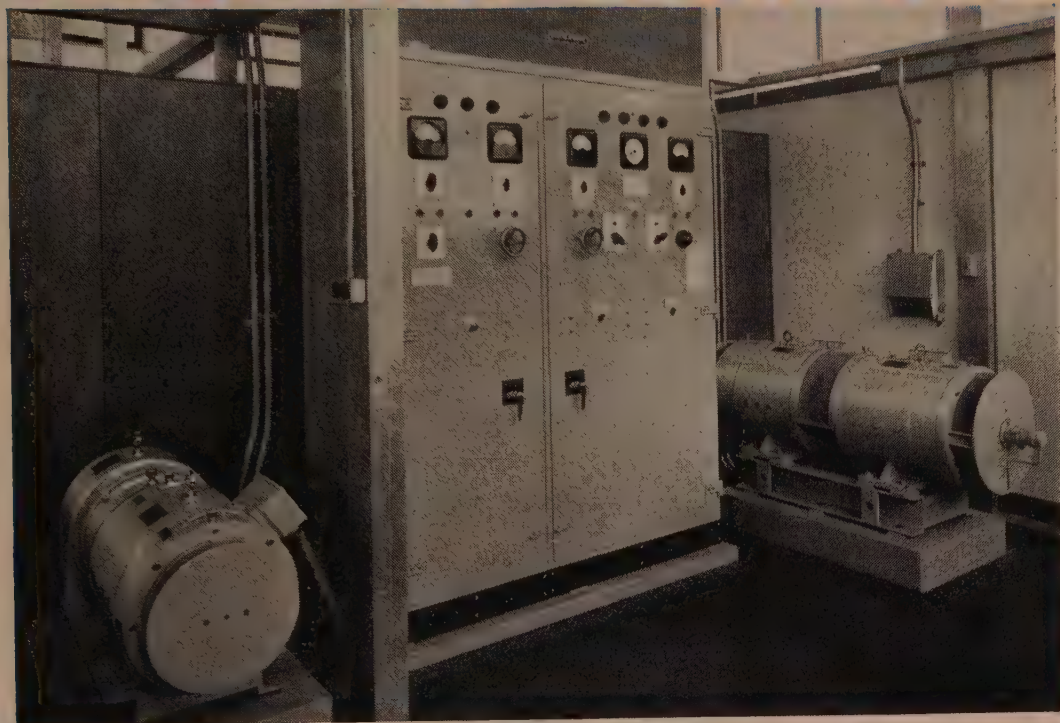
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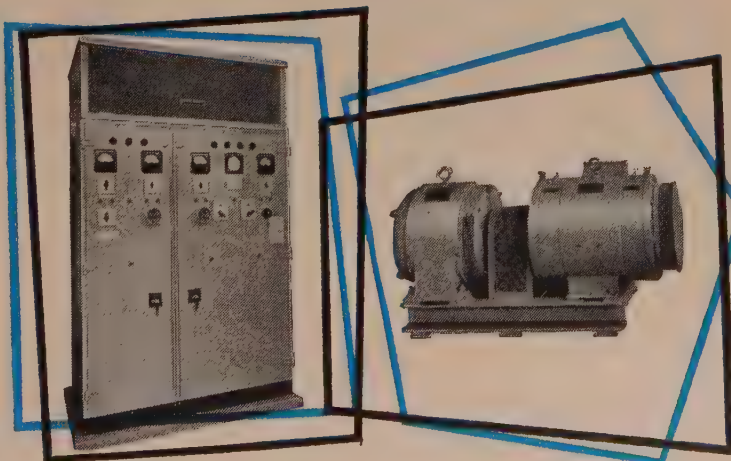


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P.5255



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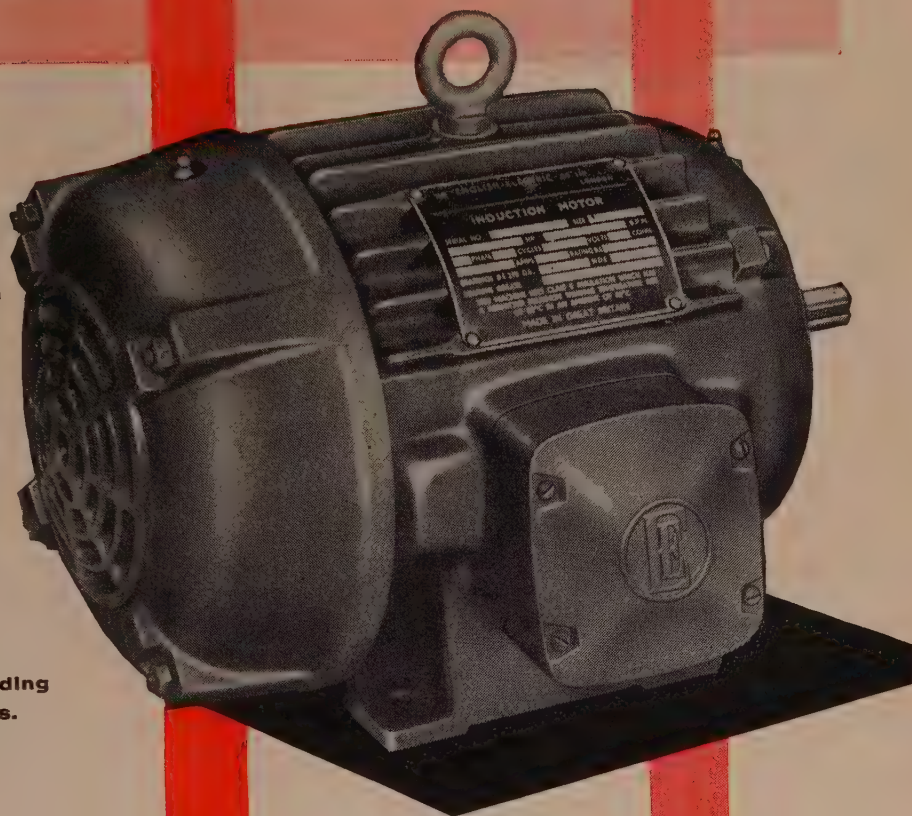
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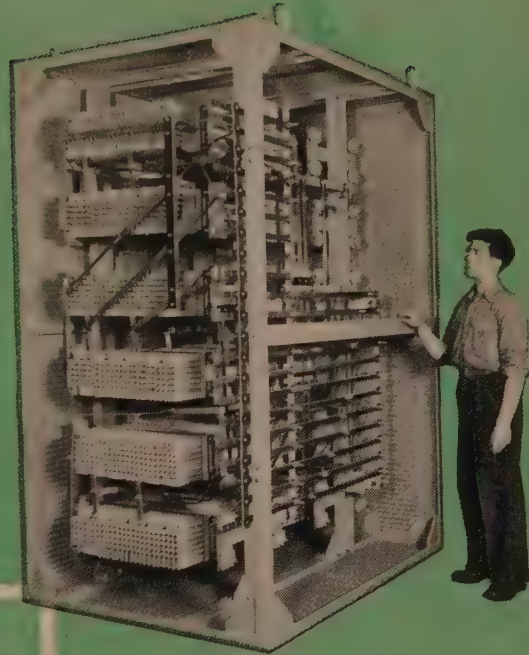
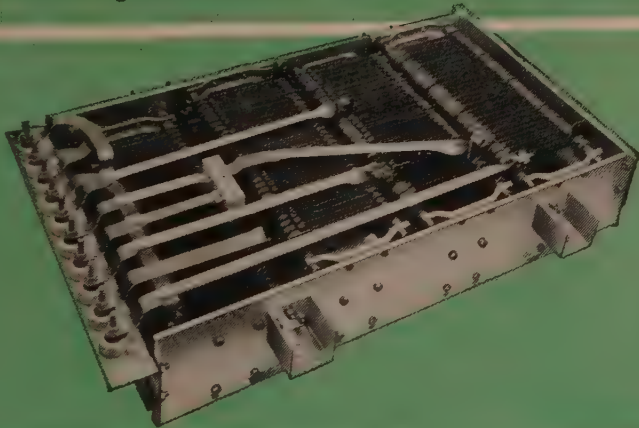



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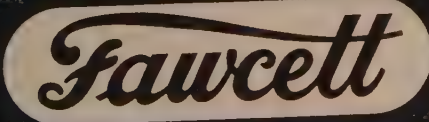
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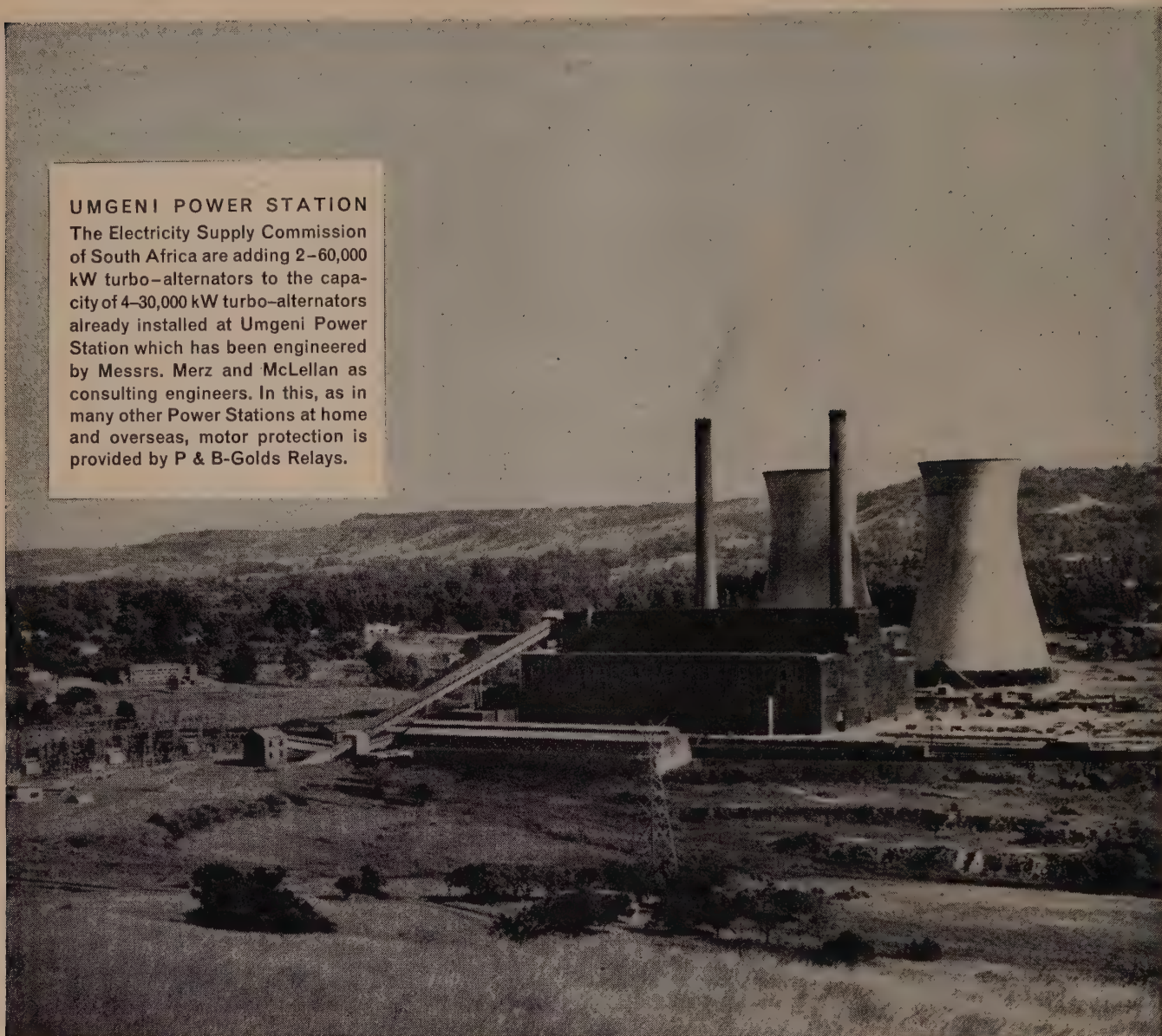


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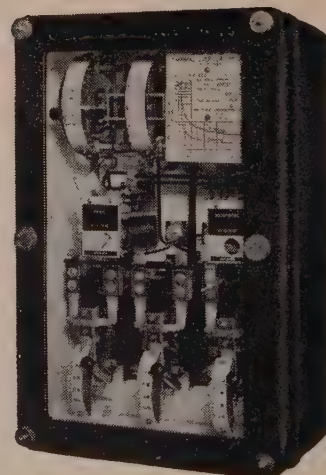


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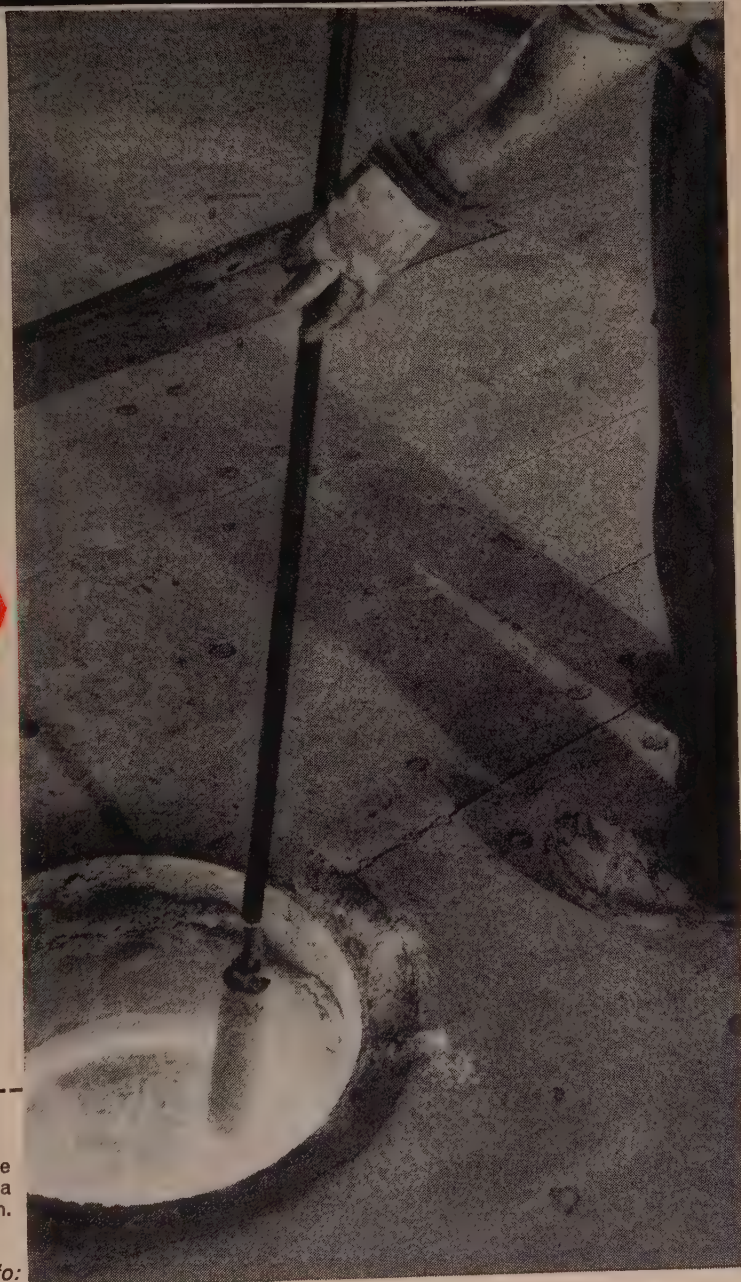
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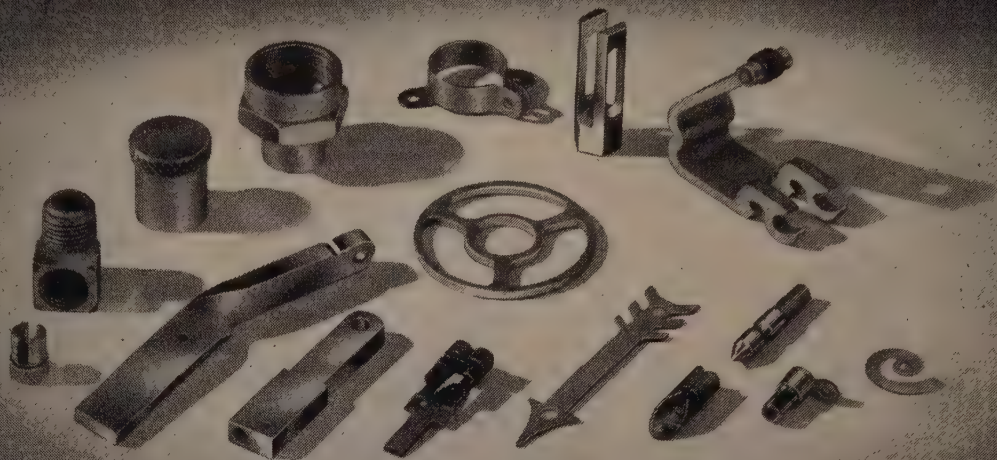
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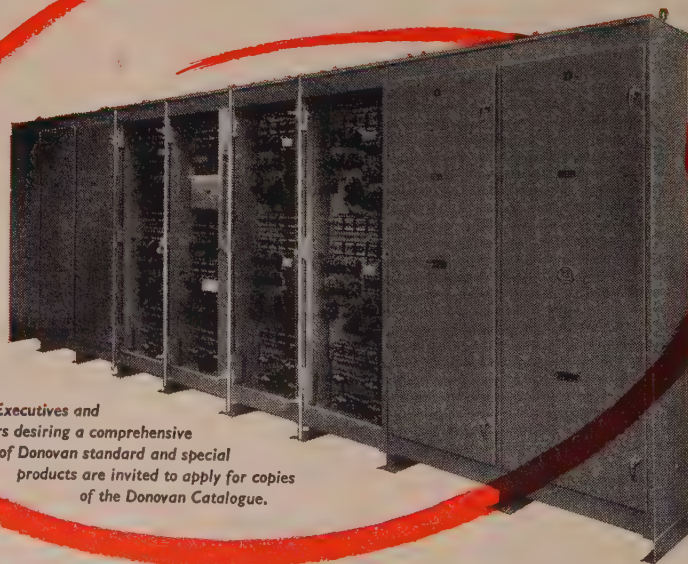
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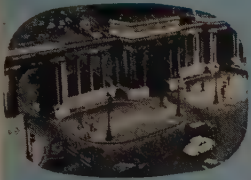
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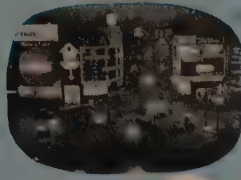
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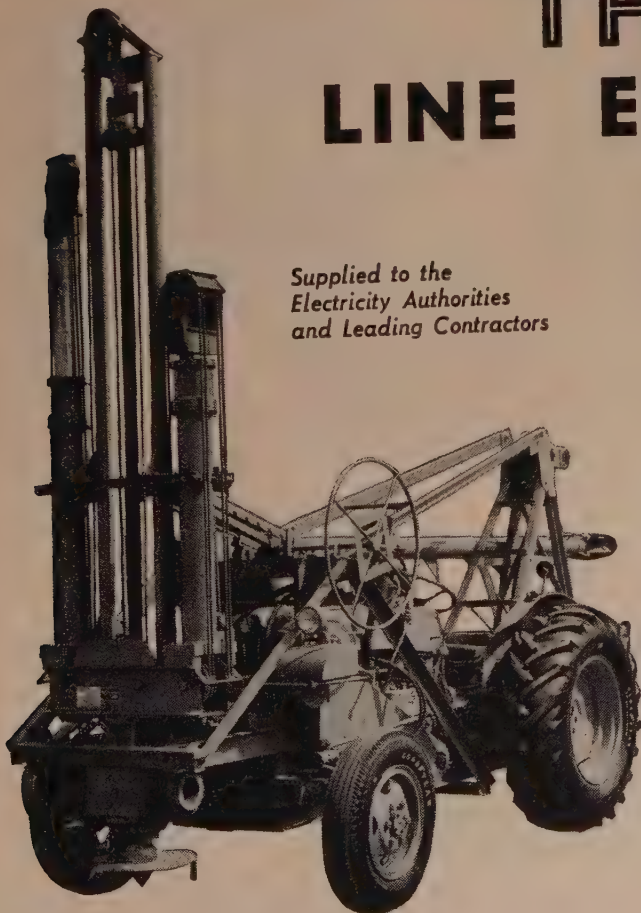
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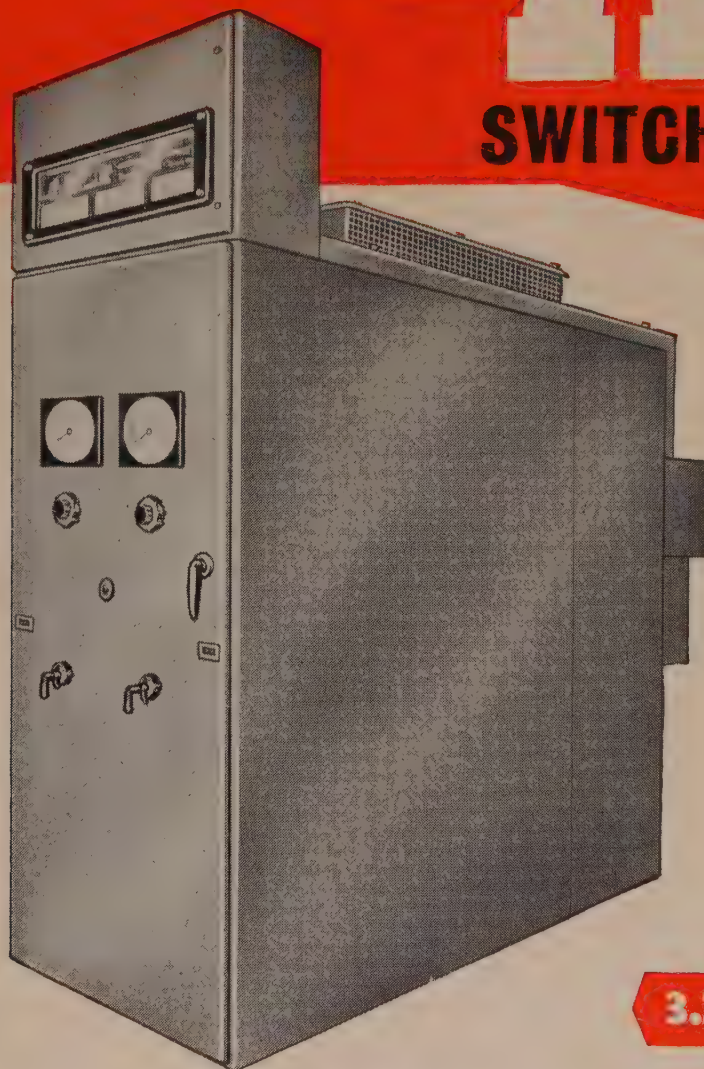
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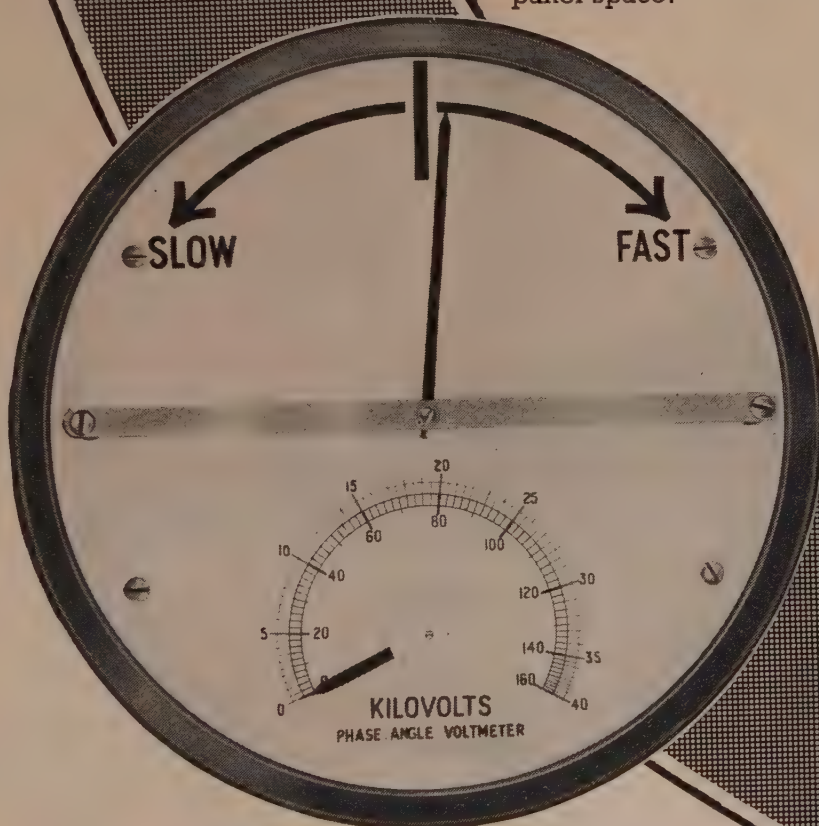


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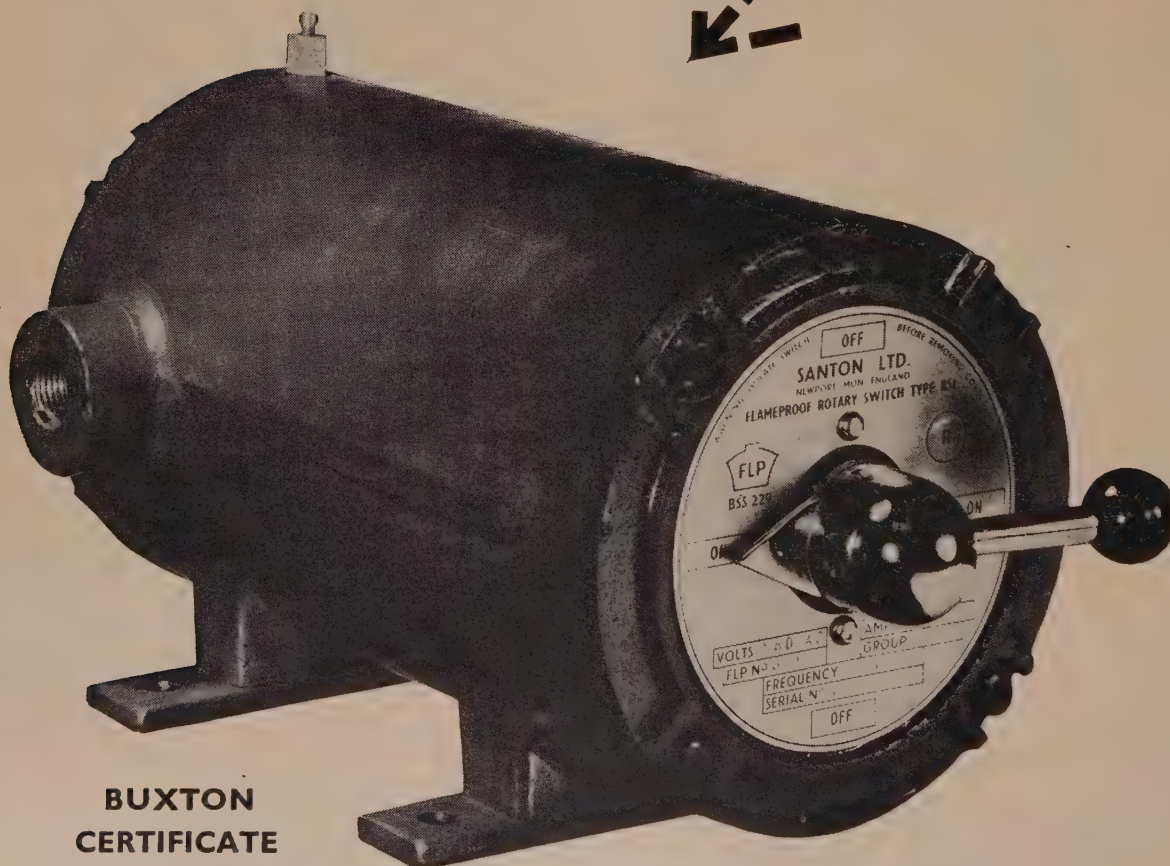


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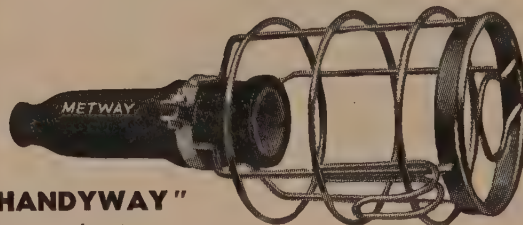


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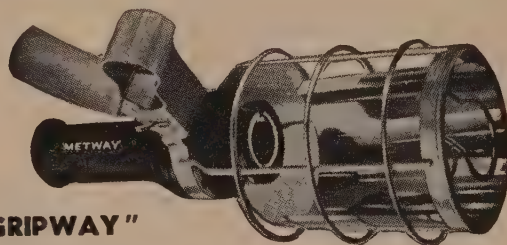


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Type 705/AW.

8/11 EACH.

Type 2705/AWS with switch. 11/11 each



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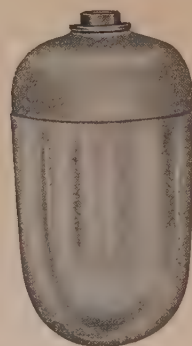
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Type 918 PH 100 watt 17/8



### WITH REFLECTOR

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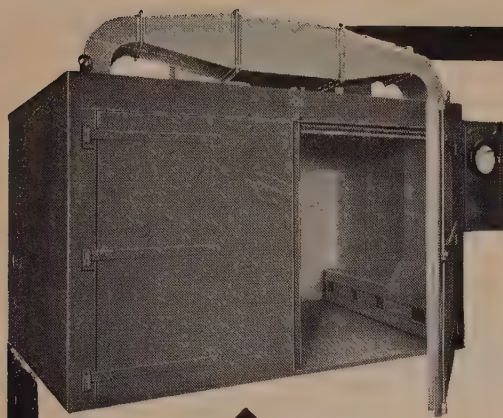
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ALL PRICES ARE INCLUSIVE OF LAMPHOLDERS

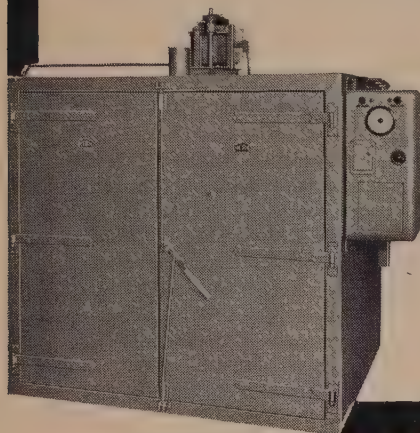
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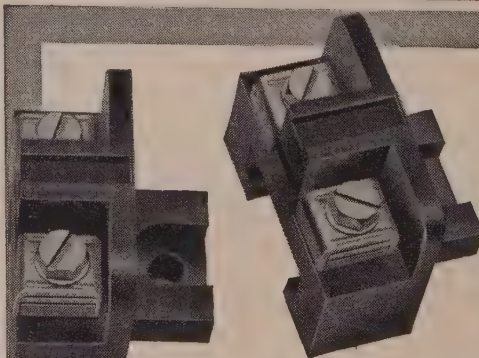
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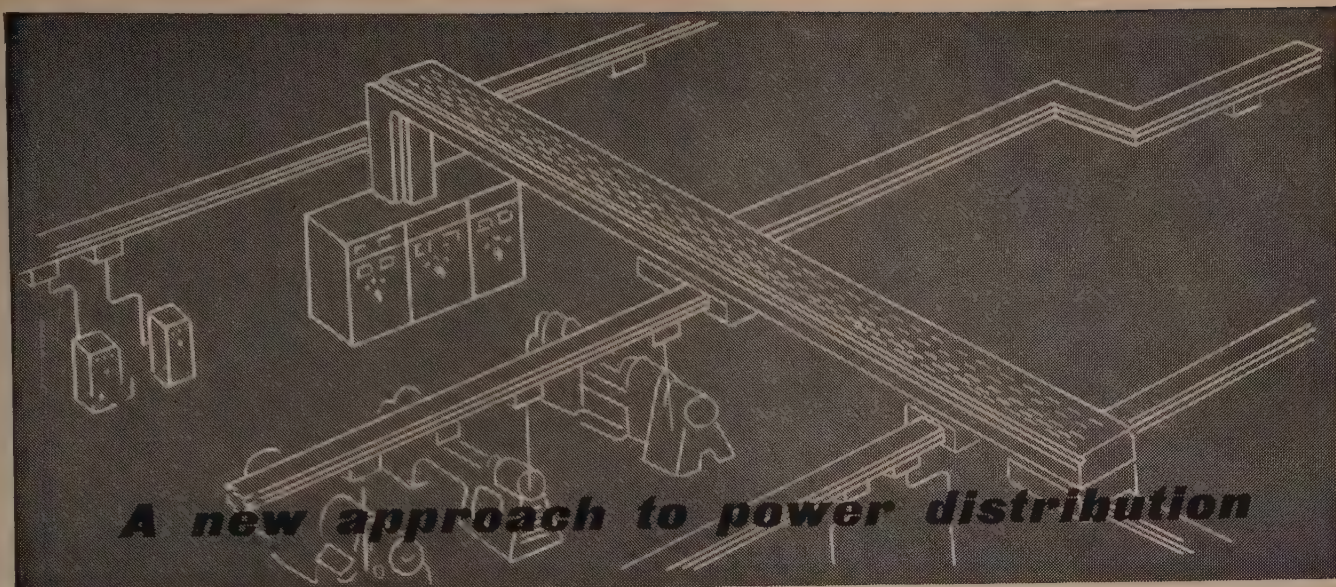
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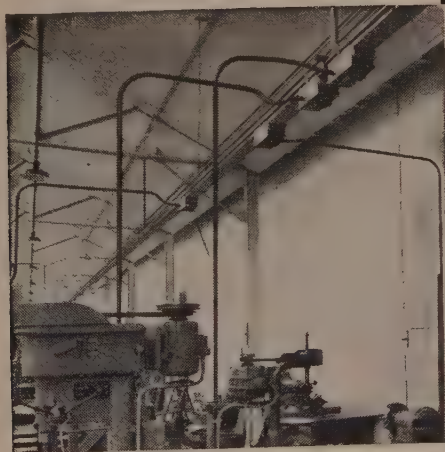




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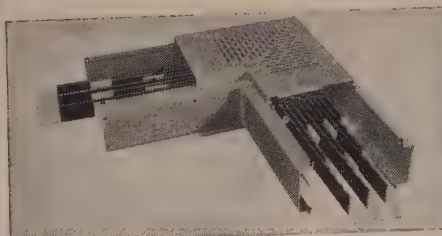
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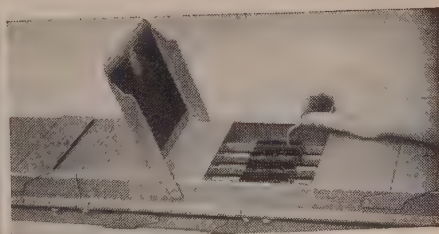


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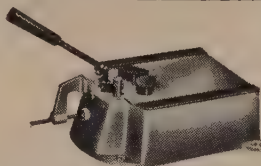


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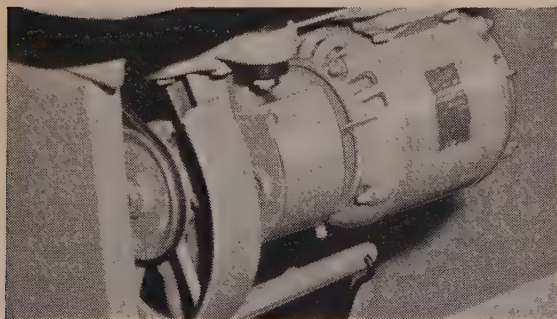
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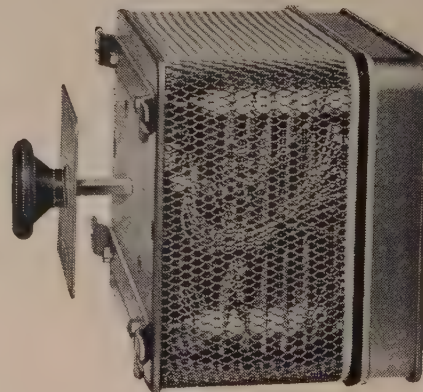
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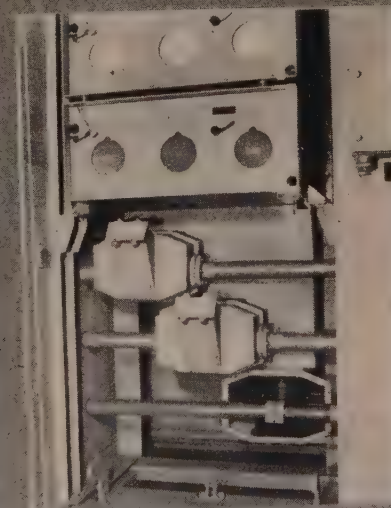
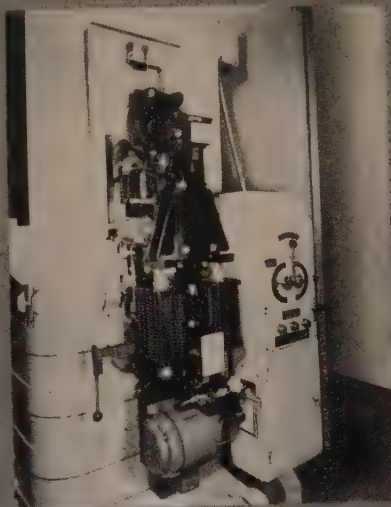
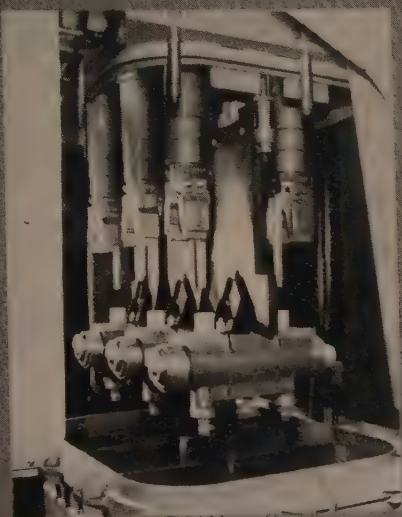
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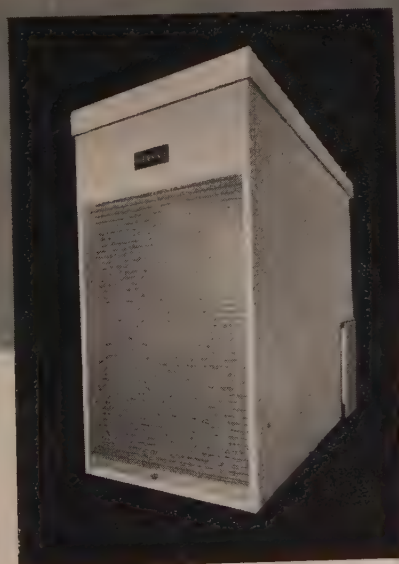
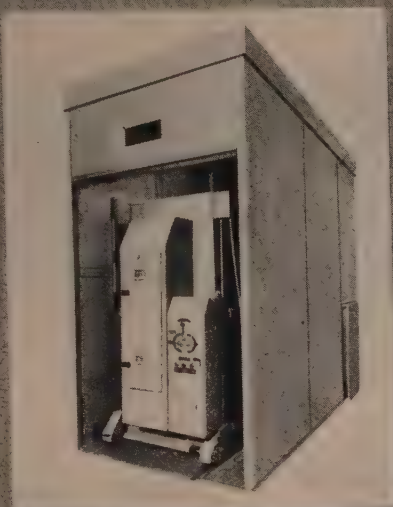
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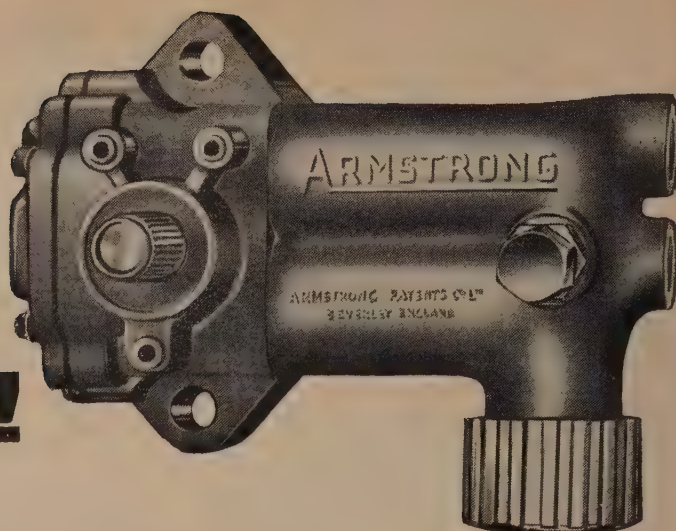
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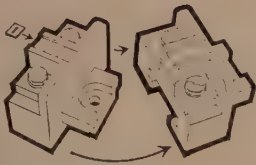
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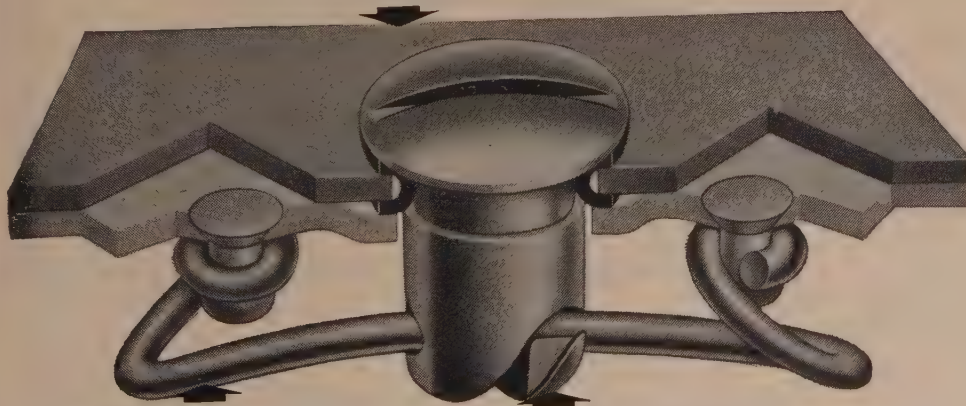
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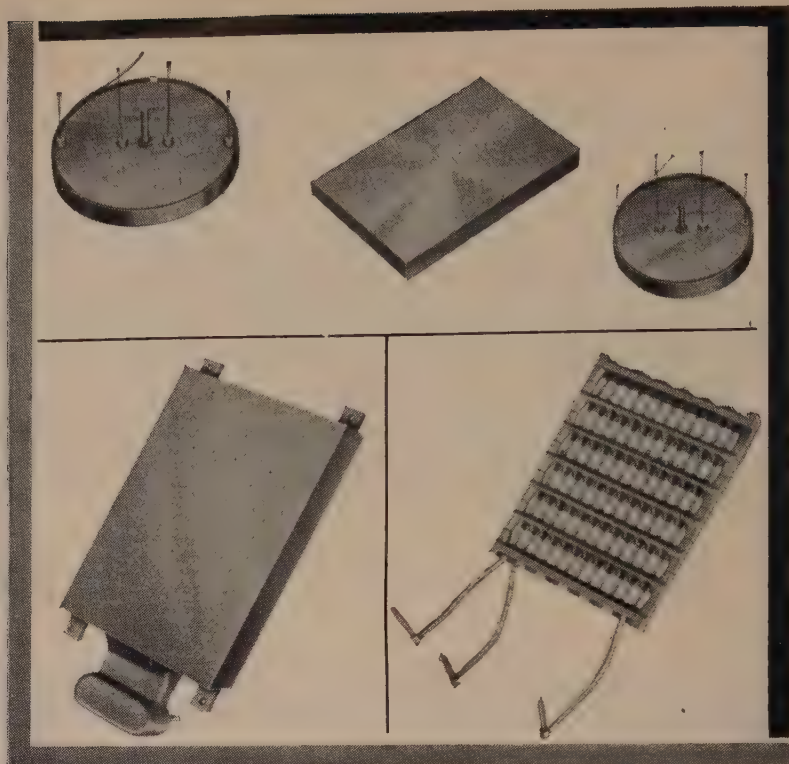
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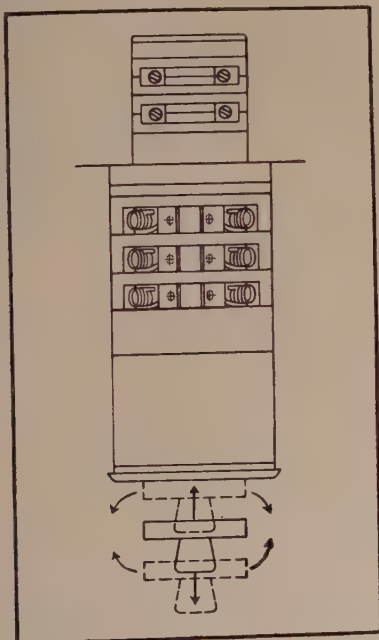
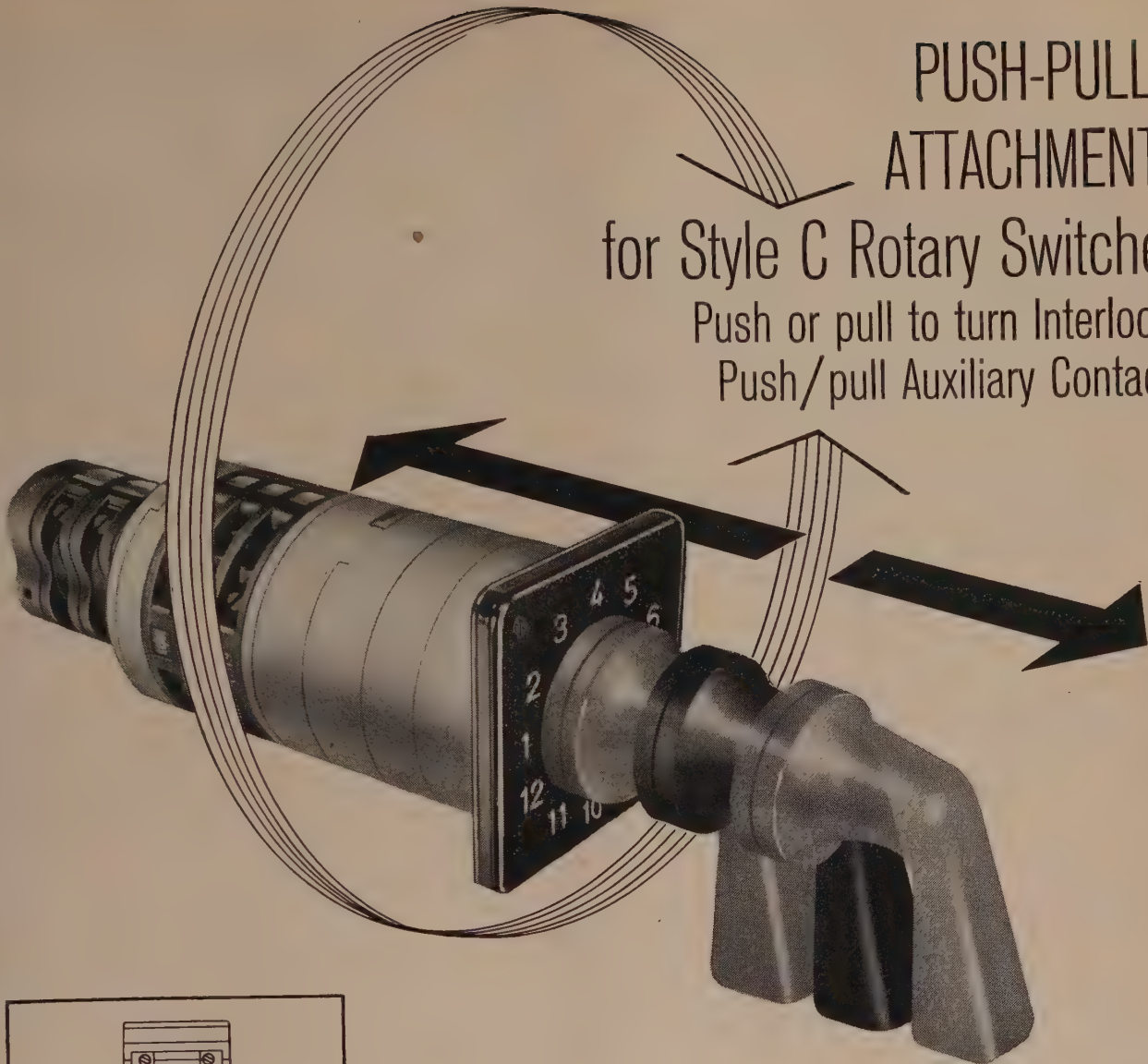
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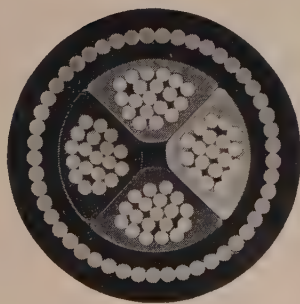


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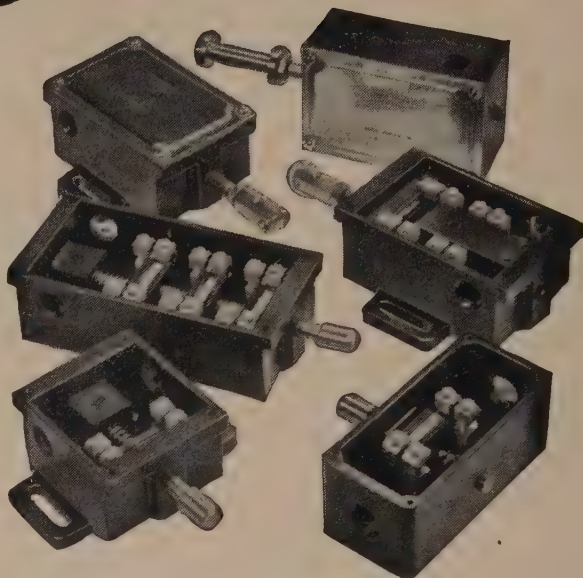
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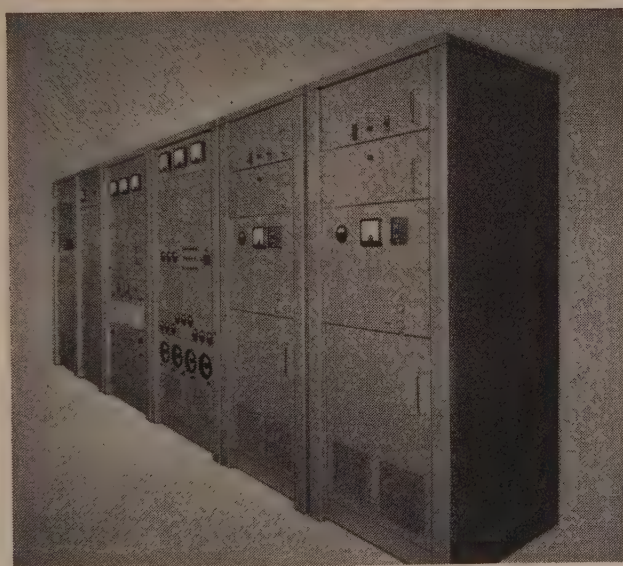




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# ELECTRICAL REVIEW

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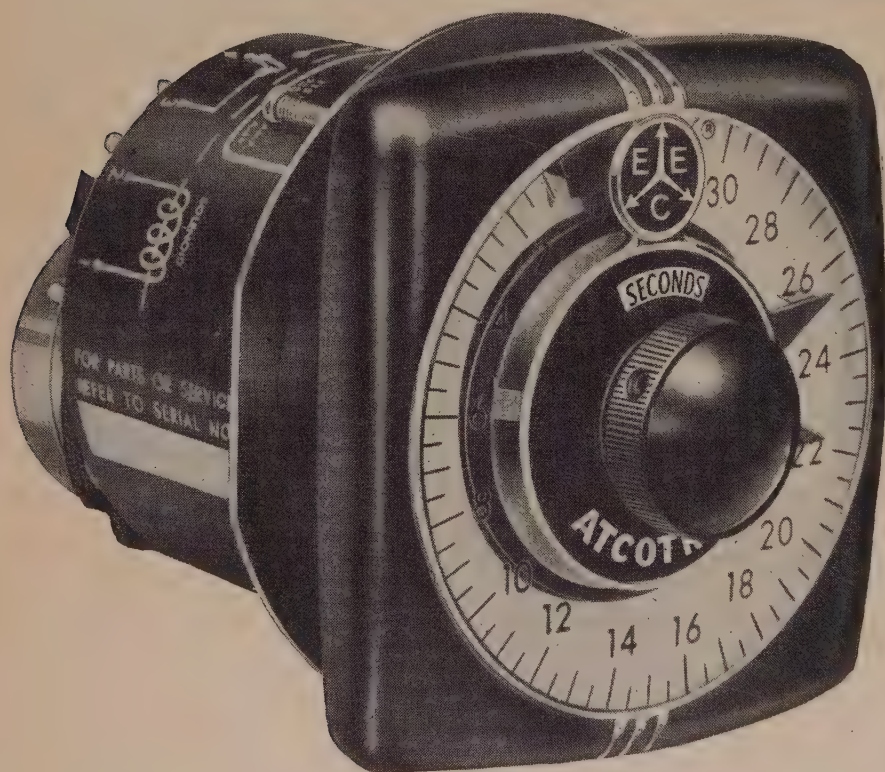
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# ELECTRICAL REVIEW

9 December 1960 Vol. 167 No. 24 Established 1872

## ***Power Philosophy***

SOME of the most impressive developments in engineering during recent years have been in the electricity supply industry. Since the end of the war striking progress has been made and today single steam turbo-generator/boiler units are being installed which have capacities equivalent to that of a complete power station of fifteen years ago. At the same time the capital costs per kW of plant installed have been reduced and thermal efficiencies have been raised to over 35 per cent in the latest designs. These developments have been recorded in the detailed articles describing new power stations which we regularly publish and it is true to say that before the war these advances would have seemed almost impossible.

Largely because of these unforeseen developments, the British nuclear power programme has had to be reviewed as the gap in competitive development has increased. After all, it is only with Sizewell, the latest nuclear power station to be ordered by the Central Electricity Generating Board, that the estimated price per kW of installed capacity has been reduced to below £100. Now that coal is relatively plentiful and conventional power stations can be built for about £50 per kW or less it is obvious that the main effort will now be devoted for some time to the full exploitation of thermal stations. Nuclear power production is no longer of such vital national importance as it seemed three or four years ago. The development of nuclear power will still proceed, but at a more leisurely pace.

In the quest for increased thermal efficiency of generation a great deal has been and is being done in the field of turbine and boiler design. Apart from this, close attention is also being paid to flexibility and ease of operation since this affects operating costs. The production of electrical energy relies to a considerable extent upon mechanical devices and until lately a power station has been a mechanical engineer's paradise where only the minimum of electrical engineering techniques were employed and the average electrical engineer felt almost out of place. The introduction of automatic electrical control systems into power stations has now placed more responsibility in the hands of the electrical engineer.

Boiler control has always been a very complicated process since there are so many variables which must be taken into account. A start was made on the introduction of automatic electronic boiler control into Little Barford "B" power station as a first step to completely automatic control of



generating plant. Here the control covers that part of the production of electricity from the pulverising mills to the superheater outlets, but at Thorpe Marsh control is likely to extend to the output terminals of the generator, the load variations being sensed at the generator instead of at the turbine inlet.

Extensive use of automatic control devices has been made at Spondon "H," which is described in this issue. This is not a conventional power station because it has been designed primarily to supply process steam to an adjacent textile works. The electrical control scheme embraces the entire plant from the raw water inlet to the outlet steam main and ensures optimum running conditions at all times. Although the total back-pressure generating capacity is only 30 MW, the station will be operated on base load since there are no condenser losses and, consequently, the efficiency of generation is high.

### SECRET RECOMMENDATIONS

Lord Morrison of Lambeth tried to elicit from the Government last week why it had been decided not to make public the report of the Stedeford Committee on British Railways. Lord Chesham, Joint Parliamentary Secretary, Ministry of Transport, said that the Committee had not produced a report; it had just made recommendations. Its proceedings had been confidential and any decisions made as a result of the recommendations would be the responsibility of the Government and would be justified by Ministers.

While those giving evidence to the Committee may have done so on the understanding that their views were confidential, it is difficult to understand why, in a matter of great public interest, the Committee's conclusions are kept secret. Any decisions taken by the Government as a result of the recommendations may have a profound effect upon the future of the railways and, naturally, upon those concerns in the electrical industry which have made special arrangements to meet British Railways' electrification programme. In this, as in other similar matters, the Government seems to have little regard for the ultimate good of the country, being concerned only with immediate financial considerations.

### STEAM, OIL AND ELECTRICITY

Doubts about the advantages claimed for the diesel-electric locomotive in the United States compared with the steam locomotive were expressed by Mr. H. F. Brown, an American railway consultant, in a paper which he read last week before the Institution of Mechanical Engineers. He admitted savings in fuel costs but questioned whether other economies, e.g., less track maintenance, had been achieved.

In commenting on the paper *The Times* begins by bracketing diesel-electric and electric locomotives as though they were the same thing and it concludes by saying that Mr. Brown's survey of American experience warrants the closest examination in Great Britain.

### EVENTS IN 1961

Next week's issue will include as a supplement a wall sheet giving the principal events of electrical interest during 1961. It is so designed as to give space for the entry of the reader's own engagements. Make sure that you get your personal copy

Conditions generally are so different in the two countries that comparisons may not be entirely profitable. The comments seem to imply that the decision to eventually do away with steam locomotives was perhaps too hasty. We have seen no positive indication that British Railways have abandoned their view that the use of diesel and diesel-electric locomotives is a "half-way house" to complete electrification, although they may now be under pressure to recant. Anyhow, in a later interview, Mr. Brown said that he was sure that the modernisation plan was sound.

### MERGERS OR MUTUAL AID?

When two organisations of comparable size contemplate "getting together" questions of precedence are apt to arise. That may be the reason why the proposed combination of the English Electric Co. and the General Electric Co. is not now being proceeded with. No public explanation has been made although it is a matter of wide public interest.

One looked-for outcome of the merger was said to be co-ordination on the heavy plant side. It seems to us that if either company has spare capacity in that or in any other field it should be possible for it to make arrangements to help the other out, short of merging the whole of their organisations. This kind of mutual aid is not unknown in the electrical and other industries.

### WINTER PROSPECT

Adding two and two to make a sensational six is common practice in some of the newspapers. A front-page story in the *Daily Mail* on Monday made it appear certain that there would be severe power cuts during this winter. It was said that the Government had been warned of this by the "heads of the State-run electricity industry" and that an emergency plan had been drawn up. Actually the "plan" is a safeguard customary at this time of year.

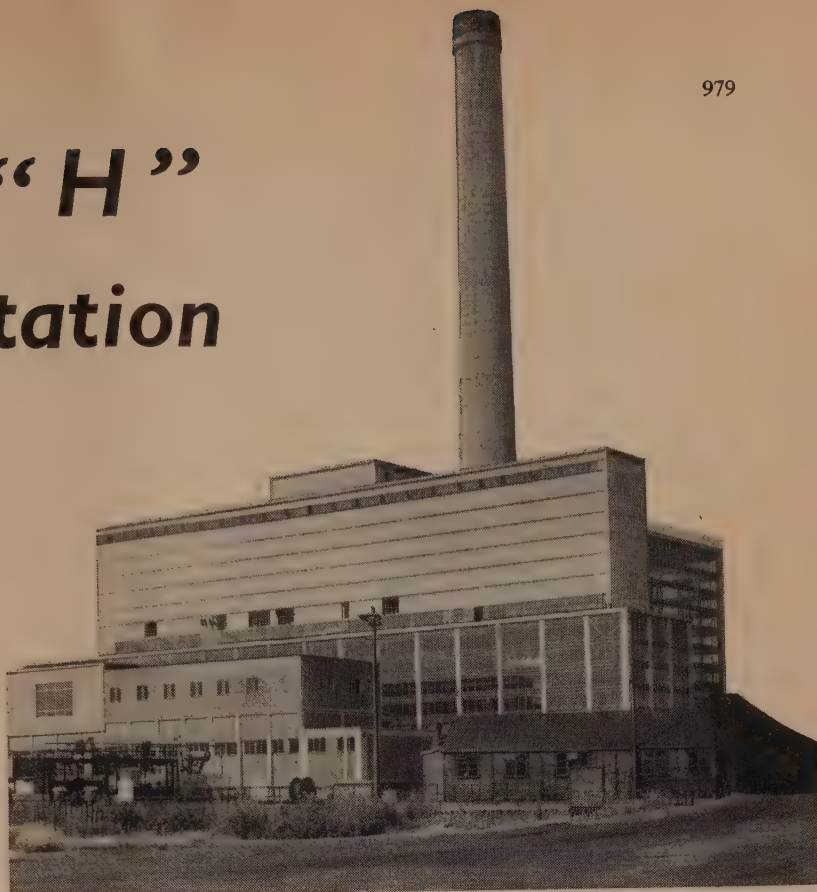
The writer, quite truthfully, mentioned the recent abnormal increase in consumption (for the twelve months to October electricity sales rose by 13.7 per cent above the 1958/59 figure which itself was only 6.5 per cent more than the 1957/58 equivalent). Much of this doubling of the normal rate of expansion was caused by the dreadful summer which followed an abnormally good one. If severe conditions prevail this winter, causing not only higher electricity consumption but also imperilling coal supplies and transmission lines, there may be some trouble, but it will not be on the scale predicted.



# SPONDON "H"

## Generating Station

Primarily designed for supplying process steam to the adjacent Courtaulds Works, Spondon "H" (H stands for "Heat") station is the outcome of a contract between the then Central Electricity Authority and British Celanese, Ltd., now Courtaulds, Ltd. Site work commenced in July, 1956, and the last boiler and back-pressure turbo-generator were commissioned during September and October, 1960



**T**HE main plant at Spondon "H" power station consists of four 180 klb/hr boilers and three back-pressure turbo-generators with three pressure-reducing valves arranged as standby to the turbines. The boiler design conditions are 950 p.s.i. and 895°F and the turbine or pressure-reducing final conditions are 160 p.s.i. and 520°F. The temperature of the steam supplied for process is 510°F and this is achieved by secondary desuperheaters situated downstream of the turbines and pressure-reducing and primary desuperheating plant. Extensive use of automatic control devices is made throughout the station.

A feature of the station is that no condensate is returned from the works of Courtaulds, Ltd., and thus plant capable of treating 100 per cent make-up is provided. The raw water is supplied by Courtaulds at a temperature of 125-140°F.

The operation of the station depends on the demand by Courtaulds factory, which is normally operated on a 24-hour seven-day week basis. The factory is only shut down for one three-day maintenance period each year, usually over Easter. However, the Spondon "H" plant is so arranged that turbines and boilers can be taken out of service for maintenance without interrupting the steam supply to Courtaulds.

The station is situated approximately six miles east of Derby on the west bank of the River Derwent immediately to the north of the existing Spondon "A" station. The site, which has an area of about four acres, is approximately level and consists of sandy clay and ash overlying Keuper marl. The water table is about 4ft below ground level. The main building is of steel-framed construction with brick cladding from ground level up to 25ft, followed by asbestos cement sheeting above this level and patent

glazing. The main station foundations consist of reinforced concrete pile caps and beams supported on 18in diameter bored piles founded on the Keuper marl. The turbine house is 230ft by 45ft by 50ft and the overall dimensions of the boiler house are 200ft by 40ft by 120ft high. The combined volumes of the buildings give a total of 2,400,000 cu ft. The complete station has one 350ft high chimney with a top inside diameter of 14ft at the nozzle.

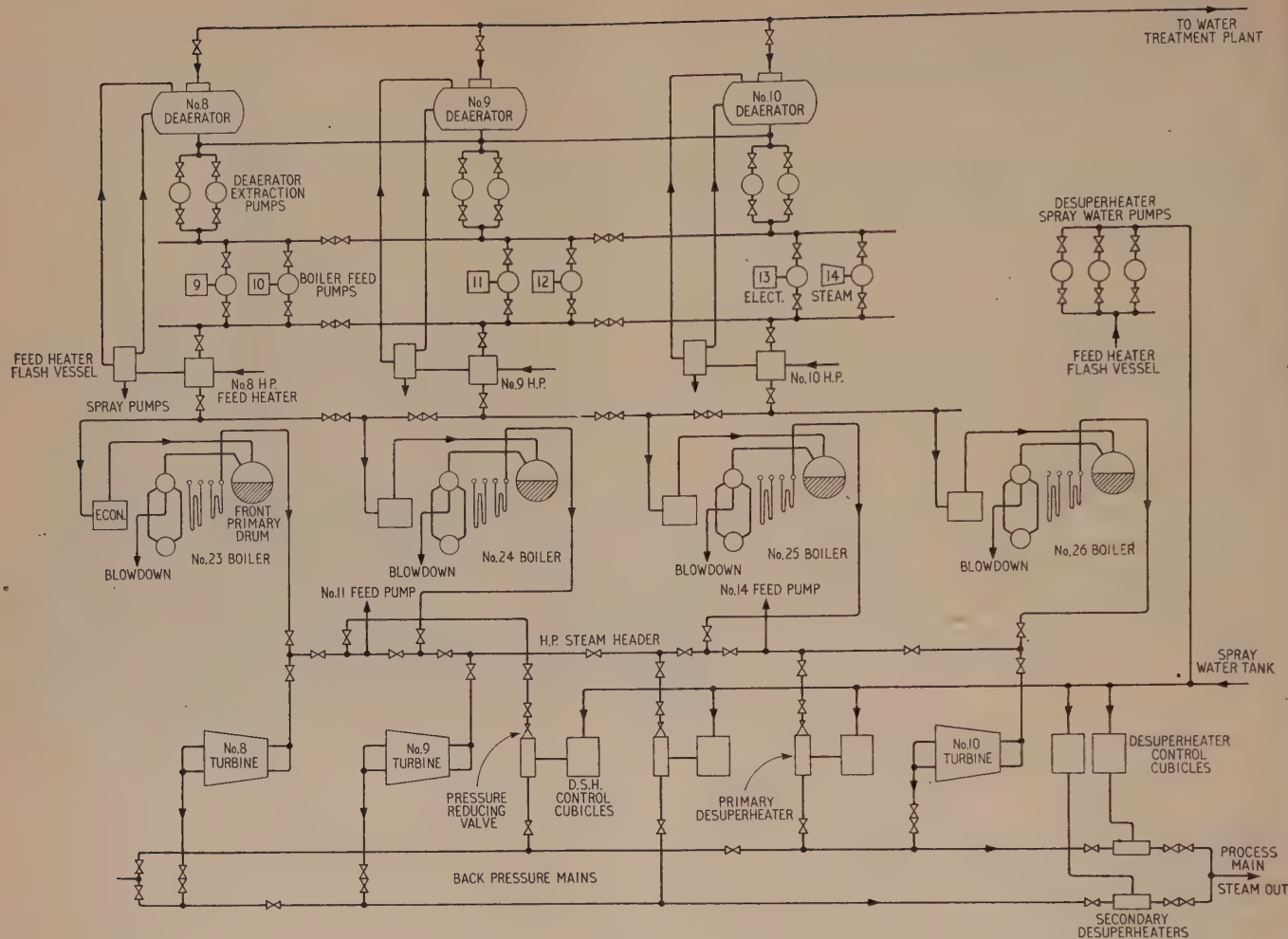
### Steam and Water Cycle

Since the station is mainly concerned with the production of steam, its operation can best be described by tracing the steam and water cycle (Fig. 1). The raw feed water, at 135°F, is first fed into the water treatment plant and is thence pumped to the three parallel low-level de-aerators in the station basement. It is extracted from the de-aerators and passed through the three parallel feed heaters by the feed pumps and thence to the boilers. From the boilers, the steam normally passes to the process steam main via the back-pressure turbines. If the turbines are shut down, the pressure-reducing valves and primary desuperheaters are employed, but in either case, secondary desuperheating equipment is used to accurately control the condition of the steam being fed to Courtaulds.

The raw make-up water is obtained from the Derwent via Courtaulds process systems and is connected into the raw water booster pumps which feed the water treatment plant. These pumps are rated at 70,000 gal/hr and are each driven by 50 h.p., 440 V induction motors.

The 100 per cent feed capacity Permutit water treatment plant has a maximum continuous rating of 765,000 lb/hr at an average temperature of 228°F. The plant comprises two hot pressure-type lime reaction





softeners followed by eight pressure filters and, finally, three hot base-exchange Zeolite softeners. The plant is so designed that an output of 500,000 lb/hr can be maintained with one lime reaction tank, one base-exchange and one filter out of commission.

The raw water entering the main lime reaction tanks is measured by Bailey meters having automatic electro-mechanical control of the lime cream dose proportional to the raw water inflow. Manual adjustment of the doses is, however, necessary to meet changes in the raw water quality. The partially softened water then passes on to a battery of eight filters where the final particles of suspended matter that cannot be removed by settling alone are arrested. The filter beds consist of suitably graded anthracite to avoid silica pick-up by the hot alkaline liquor, as would be the case if sand was used at a high operating temperature. The filtered water is then fed by three booster pumps to the hot base-exchange softeners and the treated water is discharged into the 10in inlet main to the power station.

Flash vessels and raw water heaters using the boiler blowdown as a heat source are included in the cycle to supplement the feed heating train. There are four Sulzer 300,000 lb/hr feed pumps, each rated at 100 per cent duty and driven by 600 h.p., 3.3 kV, 2,950 r.p.m., A.E.I. induction motors. Two steam-driven feed pumps, also rated at 300,000 lb/hr, have been provided since the boilers are equipped with chain grate stoking and thus cannot be shut down immediately. The inlet pressure

to the feed pumps is 50 p.s.i. and they discharge at 1,250 p.s.i.

### Boilers

The Foster Wheeler boilers installed at this station are of the three-drum, dual natural circulation type with continuous blowdown and are fired with coal on travelling chain grate stokers. Each of the four boilers is rated at 180 klb/hr with superheater outlet design conditions of 950 p.s.i. and 895°F at m.c.r. The feed water temperature at the economiser inlet at m.c.r. is 360°F and the water flow is 220 klb/hr.

These dual circulation boilers have two separate heat absorbing sections and each section has an independent circulation system. The front primary radiant section consists of a conventional boiler with a single steam and water drum and a superheater section. The secondary circuit of the boiler consists of a top steam drum and a bottom water drum both situated in the rear pass of the boiler. About 4,550 sq ft of boiler heating surface is exposed to radiant heat while the total heating surface is 11,255 sq ft.

Feed water passes through the Senior economiser and is admitted to the front primary boiler drum. Owing to rapid heating in the primary section of the boiler, silica and other solids are held in suspension in the primary steam drum and removed to the secondary steam drum by a continuous blowdown which also acts as a feed for the secondary section. In the secondary section, the



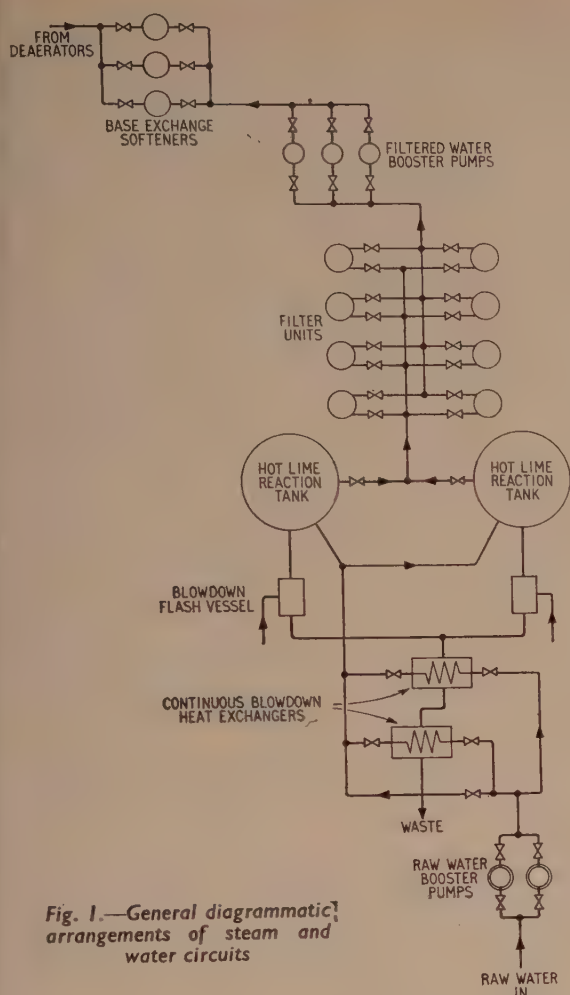


Fig. 1.—General diagrammatic arrangements of steam and water circuits

convection heating is a slow process and the solids are deposited; thus the concentration of solids in the primary section is at a much lower value than that in the secondary section. Steam produced in the secondary rear steam drum is returned to the primary steam and water drum where it is condensed in a special section of this drum. There is no carry-over of silica and other solids in this steam path. Steam from the primary section is then passed to the superheater.

A total of 20 per cent of the boiler evaporative capacity is continuously blown down from the secondary section to remove the deposits of silica and other solids. This steam is passed to the blowdown flash vessels and finally through the blowdown heat exchangers to waste. The steam flashed off in the blowdown flash vessels is used to provide most of the live steam heating for the raw water in the hot lime reaction tanks.

A further point in connection with the adoption of a dual circulation boiler is that it generally reduces the need for having water treatment plant capable of delivering water with such an extremely low total dissolved solids content as that required for a conventional boiler of the same pressure.

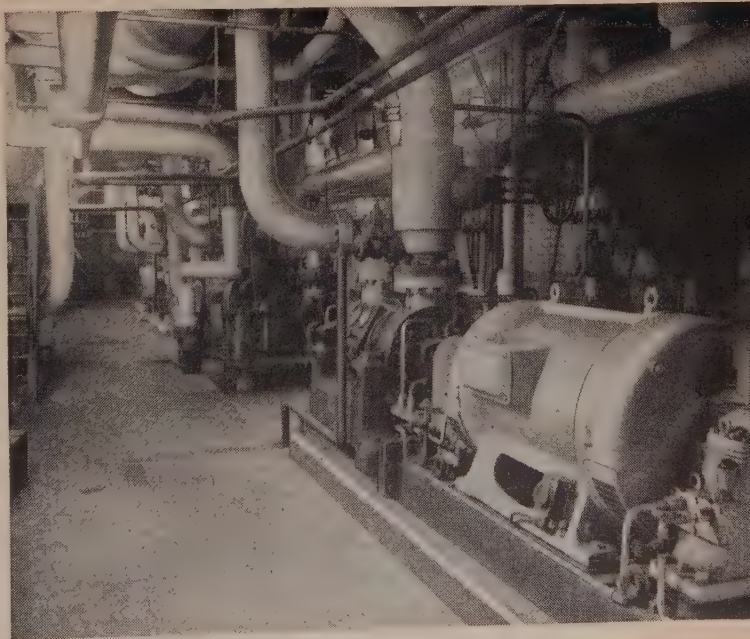
Superheater steam temperature is controlled by Foster Wheeler steam temperature control condensers and a James Gordon temperature control system. The temperature of the steam leaving the superheater is measured by thermostats while changes in the air flow (boiler load) are detected at tapping points on each side of a venturi

installed in the f.d. fan inlet ducting. Since air flow changes will be detected before the steam temperature has varied, the air flow signal acts as an override to the temperature signal. The final control signal is used to vary the feed water flow to the control condenser in the primary superheater inlet header. The dryness fraction of the steam is, therefore, reduced in proportion to the amount of feed water and this, in turn, reduces the final steam outlet temperature. Hagan automatic combustion control has been supplied by James Gordon & Co., Ltd. This regulates the furnace pressure automatically while combustion and secondary air flow are regulated remotely by hand.

The output of the four boilers is connected into the

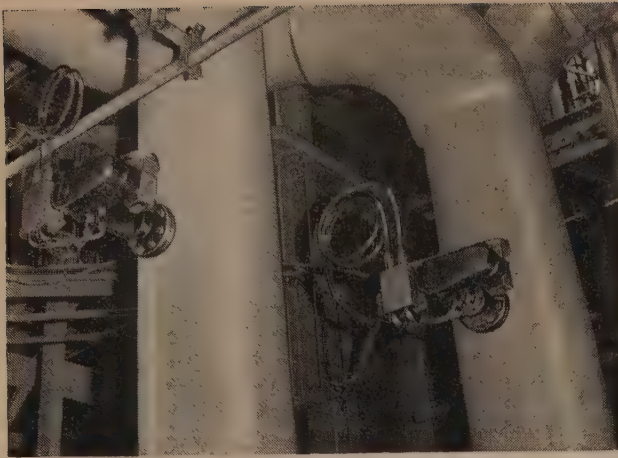


The hot pressure filters and pumps in the raw water treatment house

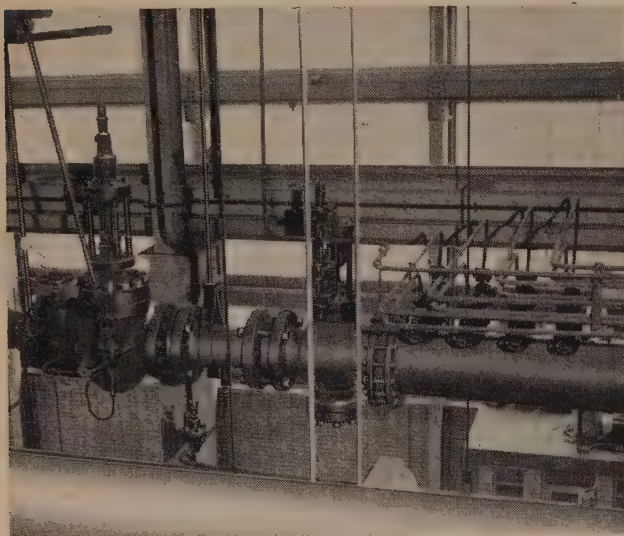


Boiler feed pumps. A steam driven feed pump is the next in line

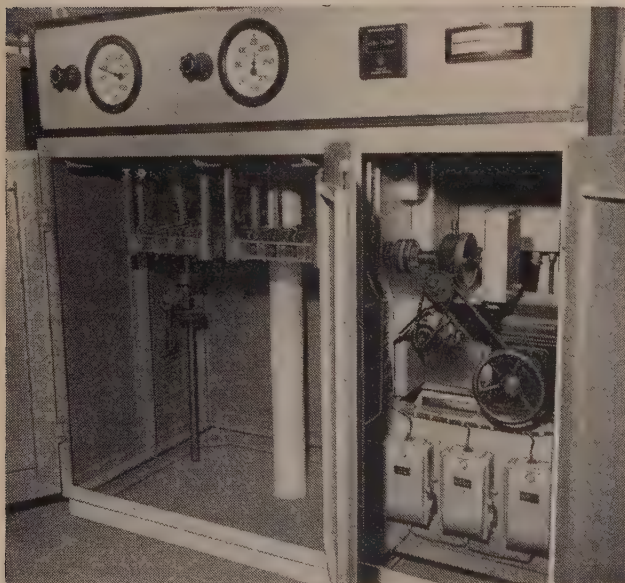




Thermostats measuring the steam temperature after Nos. 1 and 2 primary desuperheaters



No. 3 pressure-reducing valve (left) and associated desuperheater in course of erection (right)



Desuperheater spray water control cubicle

8in bore h.p. steam header, and three back-pressure turbines and three pressure-reducing valves are connected in parallel between the h.p. steam header and the back-pressure mains. Under normal conditions the turbines only will be operating, the pressure-reducing valves being an emergency standby. The steam in the two 21in bore back-pressure mains then passes into the 30in bore process steam main to Courtaulds.

Control of the turbine back-pressure is by means of a small pilot valve coupled to a spring-loaded flexible bellows which is internally supplied with steam at a pressure proportional to the turbine exhaust pressure. The nominal value of the controlled back-pressure is adjusted by changing the bellows spring compression over a range of 10 per cent. Thus the following methods of operation are available:—

(a) Running either independently or in parallel with a substantially constant-frequency system under speed governor control, the back-pressure regulator being made inoperative by a tappet.

(b) Running in parallel with a substantially constant-frequency system under the control of the back-pressure regulator with the speeder gear suitably adjusted, the turbine steam flow varies so as to maintain the exhaust pressure constant, the electrical output fluctuating correspondingly.

(c) In the event of the generator being electrically isolated the speed governor can override the pressure regulator.

To control the temperature of the process steam, secondary desuperheaters are fitted in the back-pressure mains while primary desuperheaters are incorporated in the pressure-reducing valve circuits. Normally, the primary pressure-reducing and desuperheating unit is selectively interlocked with a turbine and, following a turbine failure or trip-out, it is brought into operation automatically. When interlocked in this manner and with the turbine in operation, the reducing valve and desuperheater spray control valves are open and are adjusted to pass the same quantity of desuperheated steam as the associated turbine. The electrically-operated steam and spray water isolating valves are, however, closed, so that there is no steam flow through the reducing valves.

Following a turbine trip, the turbine relay oil pressure falls and operates the contacts of a pressure switch which starts up the desuperheater spray water pump and at the same time completes part of the opening circuit of the steam and water isolating valves. When the spray water pump has developed a pressure of 360 p.s.i., the circuit is completed and the steam and water isolating valves begin to open consecutively. It is estimated that the unit will pass the maximum steam quantity approximately 9 sec after the turbine trip.

The Hopkinsons pressure-reducing valves and primary desuperheaters are rated at 250 klb/hr of steam at 160 p.s.i. and 520°F, with steam inlet conditions of 950 p.s.i. and 895°F. The primary desuperheater, which has a minimum controllable throughput of 50 klb/hr, consists of a 14in bore mild steel pipe approximately 20ft long. The spray water enters through eight mild steel nozzles of ½in bore.

Once in operation the unit is self-adjusting, the reducing valves being controlled from a downstream pre-set pressure switch whilst the spray water admitted to the de-



superheater is controlled by a downstream thermostat. The pressure switch contacts alter the setting of the rotor of an electric motor which is mechanically connected to the pressure-reducing valve. The temperature control thermostat operates high- and low-temperature contacts which initiate the angular movement and direction of a selsyn motor inside the control cubicle which, in turn, rotates a spindle connected to eight cams. The position of the cams determines the opening of the eight control valves which allow more or less spray water to enter the desuperheater spray nozzles. The arrangement of the circuit is specially designed to prevent hunting of the selsyn motor drive. The maximum rate of response of each pressure-reducing valve and desuperheater is 1.66 klb/hr/sec. Pressure control is within  $\pm 5$  per cent and temperature control  $\pm 2\frac{1}{2}$  per cent.

Before passing to the process steam main, the steam temperature is finally conditioned by the secondary desuperheaters. These are similar to primary desuperheaters, but with only four spray nozzles. One desuperheater is fitted in each of the two 21in back-pressure mains and they are each rated at 600 klb/hr and are arranged to trim the final steam temperature to 510°F. The minimum controllable quantity through each desuperheater is 120 klb/hr.

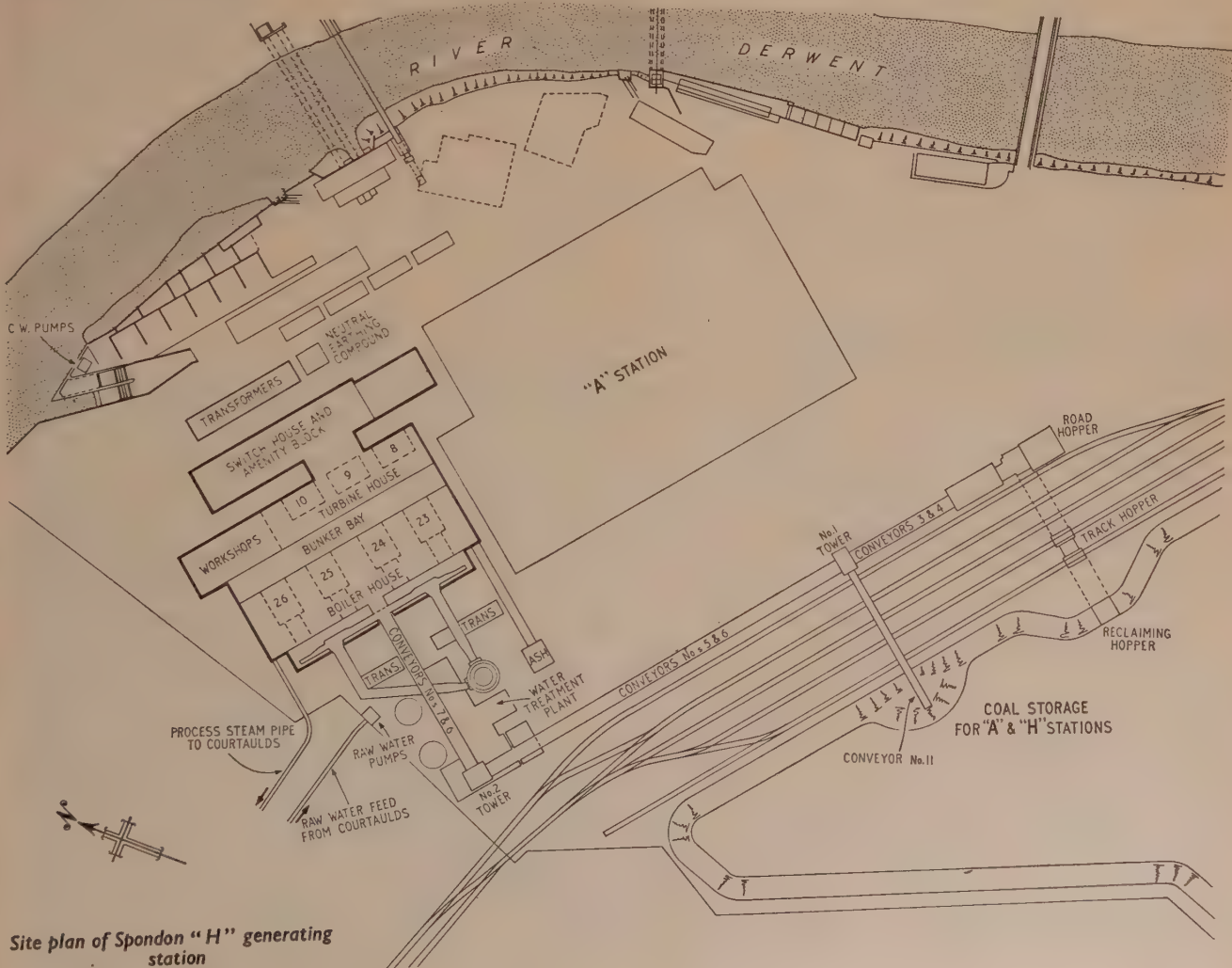
An emergency pressure-reducing and desuperheating equipment is also installed and provides a short-term emergency supply of steam to Courtaulds in the event

of total loss of supplies from the "H" station. This equipment is rated at 100 klb/hr and receives steam from the existing station boiler plant at a pressure of 375 p.s.i. and a temperature of 750°F. The minimum controllable throughput is 25 klb/hr and the maximum rate of response is 1.66 klb/hr/sec. This unit is brought into operation manually, but once in operation it is self-adjusting from downstream pressure and temperature control points. A heat balance is shown in Fig. 2.

### Spray Water

During normal operation, spray water for the primary and secondary desuperheaters is obtained from the feed heater flash vessels. Spray water requirements for each primary and secondary desuperheater operating at maximum throughput and with a water temperature of 249.8°F are:—Primary, 33,000 lb/hr; secondary, 3,600 lb/hr. When process steam is supplied only by pressure-reducing and desuperheating plants there is a deficiency of spray water. To provide for this emergency condition a spray water storage tank of 8,000 gallons is provided on the boiler house roof.

Three pumps are provided to supply spray water and each pump is capable of delivering 36,900 lb/hr of water at 249.8°F and 360 p.s.i. One pump can meet the full requirements of one primary and one secondary desuperheater. During normal operation of the station with turbines providing back-pressure steam, one pump is





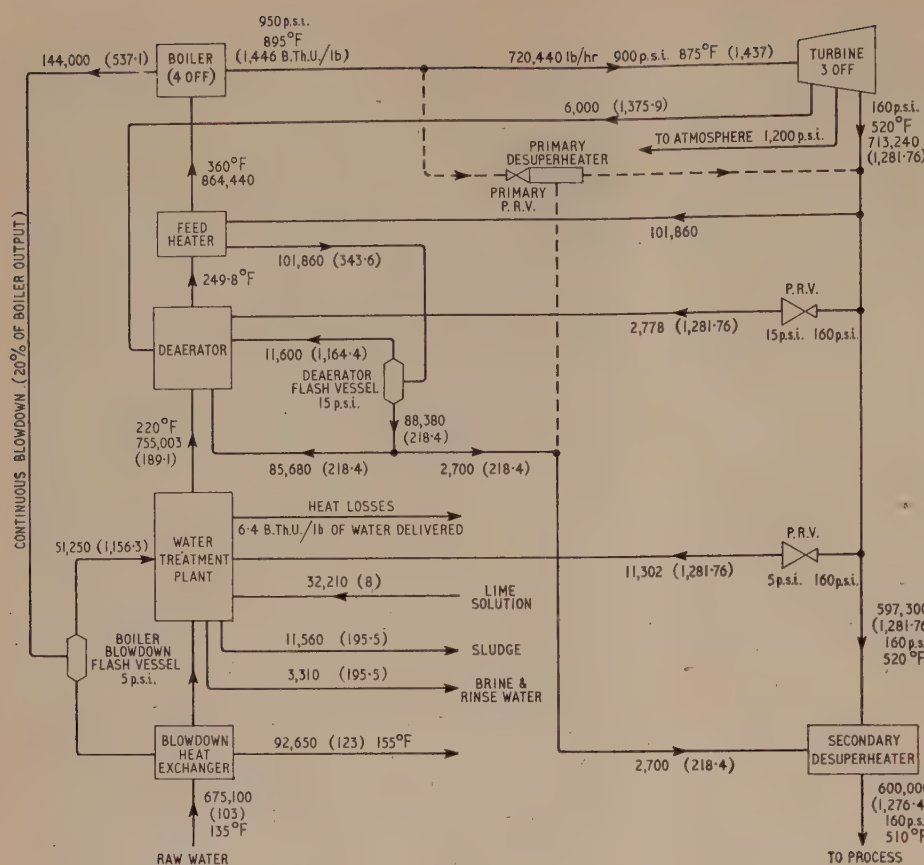


Fig. 2.—Heat balance for four boilers with three back-pressure sets in operation to supply 600 klb/hr export. (Note. Figures in brackets represent heat content in B.Th.U./lb)

tower, the coal is fed by means of automatic travelling belt shuttle conveyors to one or more bunkers as required. Each boiler bunker has a capacity of 300 tons, which is sufficient for 33 hours' operation at full load. From these bunkers, the coal is fed through chutes to automatic weighers and thence to the boiler chain grate stoker.

Each boiler is fired by a drop-link stoker, consisting of twin grates, with a total width of 23ft and a length of 23ft. The effective grate area is thus 529 sq ft. The stoker is driven by a variable speed 4/1 h.p., 415 V, 1,440/360 r.p.m. motor. This motor is controlled by an induction regulator, which is in turn governed by a pilot motor

always operating to supply water to the secondary trimming desuperheater.

### Turbines

All three single-cylinder back-pressure turbo-generators have been supplied by Associated Electrical Industries, Ltd., and they are each rated at 10.2 MW, with steam conditions at the turbine stop valve of 900 p.s.i. and 875°F. The specified steam consumption for each set at m.c.r. is 24.56 lb/kWh, including feed heating. At full load each of the turbines passes 205 klb/hr of steam to process.

### Fuel Supplies

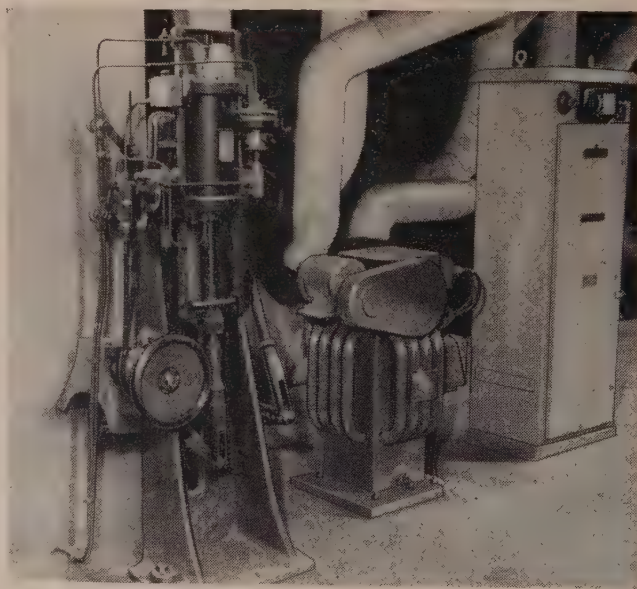
Since the boilers are normally operated continuously near their maximum rating with little load variation and as the local fuel (1½ in and below) is quite suitable, chain grate stokers have been supplied. A disadvantage is that a stoker-fired boiler cannot be shut down in under 20 minutes, but there is little economic difference between stoker- and p.f.-fired systems.

Coal can be delivered to the station either by rail, using bottom discharge wagons into ground hoppers, or by road. The Derbyshire coal of 1½ in quality has an average calorific value of 10,500 B.Th.U./lb and the daily consumption for four boilers is 1,194 tons at m.c.r. A complete fuel handling system for the "H" station has been installed comprising road and rail receiving hoppers, belt conveyors and chutes. The coal can either be passed direct from the hoppers to the boiler bunkers or to the stocking-out area. The coal storage area is common to both "A" and "H" stations.

From the weighers situated in the conveyor junction

under the boiler operator's control. The maximum speed of the grate is 1.25ft/min and the minimum speed is 0.41ft/min.

Hoppers for catching riddlings and fine ash are situated beneath the stokers and the grits thus deposited are allowed to fall continuously into the John Thompson submerged ash conveyor system. This consists of a rubber conveyor belt submerged in water contained in a steel



Secondary air damper control (left), induction regulator for stoker motor speed control (centre), and stoker motor starter cubicle (right)



trough. The hopper doors are opened below the water level thus sealing the air in the boiler and preventing any disturbance to the boiler firing. The ash is then transferred to a storage bunker and final disposal is by lorry. For dust handling, a dry vacuum system is employed, with exhausters situated in the chimney base and dust storage containers supported on the ash bunkers to which they discharge.

Air for combustion is drawn from the top of the boiler house by two forced draught fans per boiler each with inlet vane control and the fans discharge to a rotary air heater. The fans are each rated at 20,350 cu ft/min and are driven by 58 h.p., 415 V, 985 r.p.m. constant-speed motors.

The gases from the combustion chamber traverse the various sections of the boiler and the multi-cyclone dust collectors which are equipped with secondary cyclone collectors and booster fans. There are two induced draught fans per boiler and these take their suction from the dust extractor outlet. These 34,750 cu ft/min centrifugal fans are each driven by variable speed induction regulator-controlled motors, rated at 174/12 h.p., 750/300 r.p.m., 3.3 kV. Constant-speed 25 h.p., 415 V electric motors drive the two 6,750 cu ft/min secondary air fans per boiler which take suction from the front dust hopper or from the primary air ducting. The fans discharge to an insulated duct which encircles the furnace and provides the overfire air through nozzles situated on the furnace front and rear walls. The electrical arrangement is such that the f.d. and secondary air fans are stopped automatically if both i.d. fans are stopped, and all dampers are then opened for natural draught.

Since the turbines are non-condensing there is no circulating water system at this station. A small amount of cooling water is, however, required for turbine auxiliaries, heat exchangers and general services, and this is drawn from the River Derwent. About 470 gal/min of



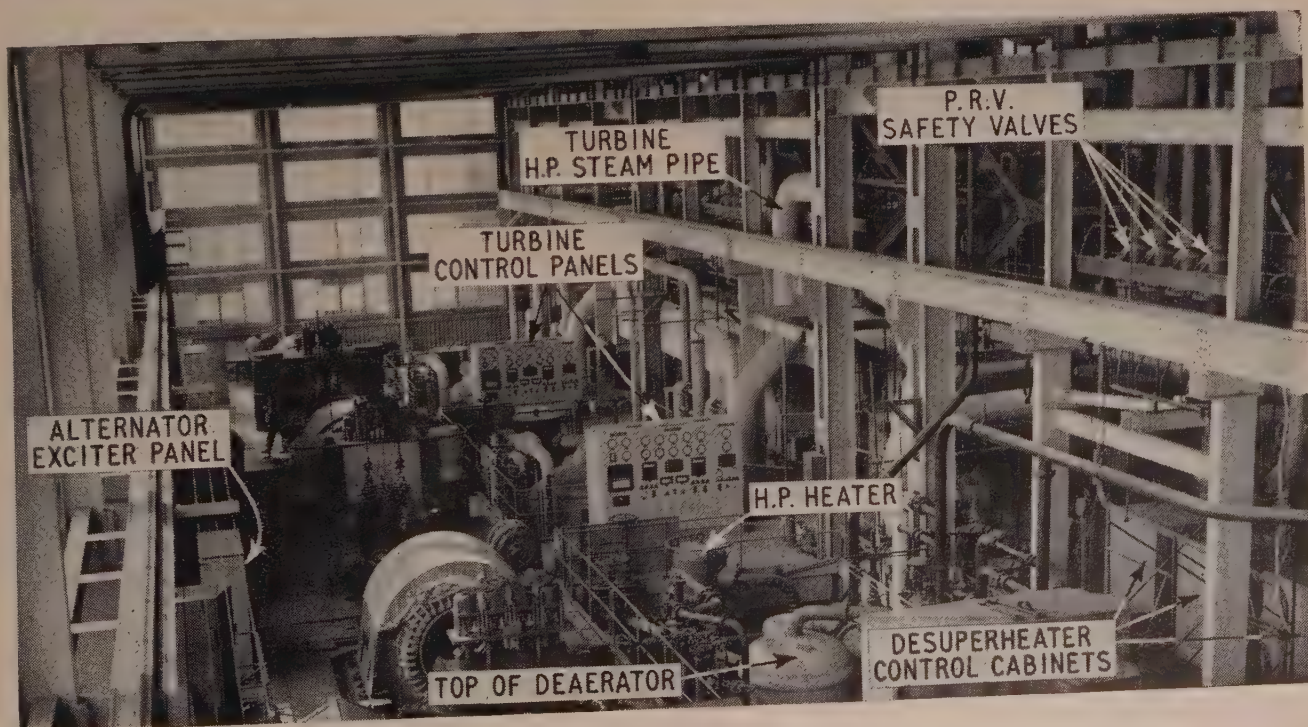
The submerged ash conveyor system

cooling water is required per turbo-generator. This is supplied by two 85,000 gal/hr pumps driven by 30 h.p. motors.

### Electrical Connections

Each of three alternators (Nos. 8, 9 and 10) generate at 11.6 kV. Generators 8 and 9 are connected to the 11 kV busbars and they are rated at 10.64 MW. No. 10 generator is rated at 10.2 MW and is connected by a 33/11 kV, 12.5 MVA generator transformer to the 33 kV, 750 MVA switchgear. Nos. 8 and 9 generators are protected by a Merz-Price biased differential system together with a three-pole reverse power relay with inverse time-limit characteristics. Standby earth fault protection has also been provided. Similar protection is provided for

General view of turbine hall





No. 10 generator, but this also includes the generator transformer in an overall system.

There are two 11/3.3 kV, 5 MVA station transformers with off-load tap-changing equipment. These supply two interconnected switchboards, consisting of 150 MVA air-break switchgear, at 3.3 kV. A third 5 MVA transformer provides emergency supplies from the "A" station 6.6 kV system. Neutral earthing switchgear is provided for both 11 and 33 kV switchboards, but No. 10 generator is independently earthed to a 300 A, 22.4  $\Omega$  liquid resistor. The new 11 kV switchgear is interconnected with the 33 kV switchgear through two 12.5 MVA, 33/11 kV transformers and the 33 kV switchgear is connected to the old 33 kV switchgear through two 45 MVA concrete structure reactors. The 33 kV switchgear in the old station is connected via transformers on to the 132 kV grid, and has been provided with a bus-zone protection scheme.

The station is controlled from a combined plant and electrical control room with generator, 3.3 kV, 11 kV and 33 kV control panels. This room also contains a mimic control panel for the steam and water circuits as well as various recorder units. There is a separate room for the steam flow metering equipment.

The station, including the main civil works, was designed by the C.E.G.B. Midlands Project Group. The architects are Cecil Howett & Partners and the main contractors are:—Main foundation and superstructure, J. Gerrard & Sons, Ltd.; main structural steel work, Edward Wood & Co., Ltd.; turbo-generators and concrete structure reactors, Associated Electrical Industries, Ltd.; boilers, Foster Wheeler, Ltd.; water treatment plant, the Permutit Co., Ltd.; coal handling plant, International Combustion Products, Ltd.; ash handling plant, the John Thompson Conveyor Co.; dust handling plant, John Thompson Industrial Constructions, Ltd.; high-pressure and low-pressure pipework, Aiton & Co., Ltd.; steam pressure reducing and desuperheating equipment, Hopkinsons, Ltd.; automatic combustion control, James

Gordon & Co., Ltd.; instrumentation, Elliott Brothers (London), Ltd.; main transformers, the Brush Electrical Engineering Co., Ltd.; 33 kV switchgear, Cooke & Ferguson, Ltd.; 11 kV switchgear and auxiliary transformers, South Wales Switchgear, Ltd.; 3.3 kV auxiliary switchgear, A. Reyrolle & Co., Ltd.; 415 V auxiliary switchgear, the English Electric Co., Ltd.; cabling, British Insulated Callender's Cables, Ltd.; main lighting, W. T. Parker, Ltd.

Acknowledgment is due to Mr. R. R. Maddock, Chief Project Engineer, Midlands Project Group of the Central Electricity Generating Board, and Mr. R. L. Batley, Regional Director, for permission to publish this article and to the resident engineer for invaluable assistance in the preparation of the material.—T.C.J.C.

## Acid Deposition in Oil-Fired Boilers

COMPARATIVE trials of solid additives intended to suppress acid deposition in oil-fired boilers were described in a paper by Messrs. P. A. Alexander, B.Sc., R. S. Fielder, M.A., P. J. Jackson, B.Sc., E. Raask, B.Sc., and T. B. Williams, A.M.I.Mech.E., presented to the Institute of Fuel. In spite of difficulties due to factors inherent in the plant and equipment, and unpredictable changes in the fuel supplied, comparable tests were made of five additives. The trial period of a fortnight was sufficient to indicate the relative superheater and air-heater fouling properties of the additives. Sufficient data were collected to provide thorough comparisons of the methods of test. In particular, the coverage of sulphur trioxide concentration and acid deposition rate was more complete than in any previous field test.

Of the basic additives tested, magnesium carbonate and zinc reduced the sulphur trioxide concentration at the air-heater slightly more than the proprietary additive, and air-heater fouling was less. Magnesium carbonate certainly reacted with a large proportion of the sulphur trioxide before the air-heater inlet. It yielded the lowest concentration of sulphur trioxide both entering the air-heater and leaving it, factors connected respectively with air-heater fouling and acid smut emission. The small quantity of deposit formed consisted almost entirely of magnesium sulphate and free sulphuric acid. Injection of the proprietary additive resulted in the formation of a hard, bonded deposit very similar to that formed during the no-additive trial and composed almost entirely of iron sulphate, a corrosion product, and free sulphuric acid. Zinc sulphate was the principal constituent of the deposit formed during the zinc injection trial, but there were small quantities of iron and vanadium sulphates. Zinc was the only additive which gave electrical dewpoints below 200°F and virtually neutral deposits in the air-heater.

The paper recommended that all oil-fired boilers should be operated with the minimum practicable amount of excess air, to suppress the formation of sulphur trioxide. Injection of pulverised-fuel ash could yield a dry air-heater deposit, but would be practicable only at lower sulphur trioxide concentrations (less than 10 p.p.m.); on-load cleaning of the air-heater would be necessary.



The combined plant and electrical control room



# VIEWS on the NEWS

By "REFLECTOR"

LAST week the *Daily Telegraph* published a story about the electricity used for lighting the large fir tree presented to London by the city of Oslo and erected in Trafalgar Square. It alleged that the citizens of Oslo would this year have to pay only 2d per unit, instead of the 6d demanded by the London Electricity Board, through the intervention of the newspaper's reporter. Inquiries into this fantastic business have educed the facts that the Board had decided to raise its charge for the West End illuminations to 6d and the tree came within the scope of the new charge; the Board says that it could not discriminate in its favour. The bill, however, goes to the Ministry of Works and it is they who pass it on to Oslo, which seems to me to be an extraordinary procedure. The *Daily Mail* accused the Board of being a "Scrooge" but the Board has provided free electricity for floodlighting London public buildings for several years. It appears to have been the Ministry of Works who have been the villains of the piece. Anyhow the matter seems to have been satisfactorily settled, for no charge is now being made for the lighting. Scrooge was, of course, eventually overcome by the spirit of Christmas.

\* \* \*

Mr. William McLennan, according to a *Reuter* report, has won a \$1,000 prize offered by Dr. Richard Feynman, a physicist at the California Institute of Technology, for the first person who could make an electric motor only one sixty-fourth of an inch in overall diameter. This remarkable achievement is about the size of this full stop. It contains four coils, each with 21 turns, and it will develop one millionth of a horsepower.

An enterprising engineer built it all in just a year, a motor in a six thou. size brought him a Californian prize. Thirteen parts including rotor, all in a quarter-flea-power motor.

\* \* \*

Three or four weeks ago I referred to a Ballycastle (Co. Antrim) lady who was in difficulties with her £200 electric cooker. The makers were said to have gone out of business and it seemed that nobody was able to repair the cooker without the makers' instructions. I am happy to hear from Mr. J. K. Kearney, of Belfast, that the cooker was repaired a few days after the "loud" publicity given to the matter by some newspapers (and by me, I'm afraid).

Apparently there is greater scope for these expensive cookers than I imagined. I learned last week from an unimpeachable source that they are becoming a "status

symbol," in the manner of motor cars. They are appearing in some of the larger departmental stores both on this account and because they attract customers who may not immediately buy them but through them are persuaded to acquire others less expensive but still above the common level.

\* \* \*

Following an outbreak of fire in a council house Boston Rural District Council tenants have been warned not to overload their electrical outlets. The chairman of the Housing Committee, says the *Lincolnshire Standard*, mentioned that some tenants were "using several electrical appliances from one power plug, or even from a lighting socket." This suggests to me that the Council should see that its houses are more generously equipped for the use of electricity.

\* \* \*

Some time ago, it may be recalled, Mr. Dudley Glanfield, a Surrey farmer, fought a long and unsuccessful battle with the Central Electricity Authority who wanted to erect transmission towers upon his property. He is in the news again; this time his conflict is with the Esso Petroleum Company whose projected pipeline from their Fawley Refinery to London Airport would pass through Mr. Glanfield's land. This land seems to be involved in almost any scheme affecting that part of the country. Mr. Glanfield says that he has already had a piece taken for a housing estate, another piece for road widening, and a "Pluto" pipeline through the farm, and now a motorway is scheduled to go straight through his post-war farmhouse.

\* \* \*

Mr. A. A. Campbell Swinton wrote to the *Electrical Review* of 12th December, 1890, to contradict statements about the failure of cables in ships. He said:

"On board, ship, even more than in the case of land installations, films of condensed moisture are very apt to become deposited on the slate or porcelain bases of switches, cut-outs, & etc., and ship engineers are very liable to attribute the resulting defective insulation to bad cables and wires, when these are really in no way to blame.

I have found that in such instances the deficiency of insulation due to this condensed moisture can be removed by electrolysis, it being sufficient to connect one pole of the dynamo to the ship's plating through a safety resistance of one or two lamps, and the other to the lamp circuits, and run the dynamo for a few hours. This has the effect of decomposing the moisture, and the result as regards improved insulation is surprising."

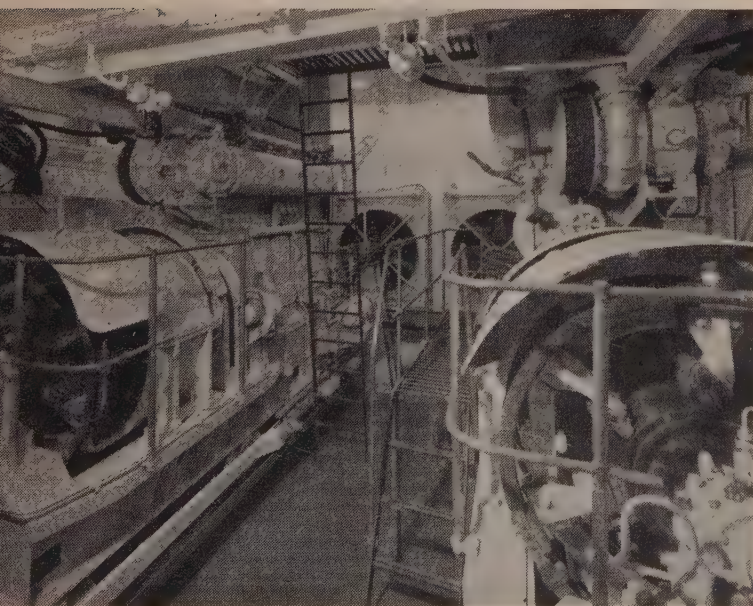




## ELECTRICAL EQUIPMENT IN NEW P. & O. LINER

**T**HE latest vessel to join the P. & O. Orient Lines fleet, the 42,500 ton *Oriana*, sailed last week from Southampton to Sydney and the west coast of North America. Built at Barrow-in-Furness by Vickers-Armstrongs (Shipbuilders), Ltd., this 804ft long ship can accommodate 2,142 passengers, in addition to the 899 crew, and 1,150 tons of cargo. The main propulsion turbines were designed by the Parsons and Marine Engineering Turbine Research and Development Association (Pametrada) and develop a maximum of 80,000 h.p. when driving the two propellers at 158 r.p.m. through reduction gearing. At the ship's service speed of  $27\frac{1}{2}$  knots they develop 65,000 h.p. at a propeller speed of 147 r.p.m. The turbines are supplied with steam at 700 p.s.i. and  $950^{\circ}\text{F}$  from four Foster-Wheeler external superheat type oil-fired boilers. Fuel oil consumption for all purposes is 415 tons a day.

*The two 200 kW diesel engined standby generators*



Electricity for the auxiliary power, lighting and other services is provided by four self-contained pass-out, pass-in turbo-generator sets constructed by W. H. Allen, Sons & Co., Ltd., one of which is normally on standby duty. Each of these is capable of a normal full-load output of 1,750 kW at 220 V d.c., with an overload capacity of 10 per cent for two hours, and is also arranged to supply low-pressure steam to all the hotel and auxiliary services. The turbines are each complete with a self-contained condenser having an exhaust vacuum of 28.5 Hg at the condenser design load and a cooling-water inlet temperature of  $75^{\circ}\text{F}$ . The normal pass-out quantity from each turbine is 7,500 lb of steam per hour, with a maximum of 18,500 lb/hr, at a pressure of 65 p.s.i.g., and the normal pass-in quantity is 11,300 lb/hr, with a maximum of 18,500 lb/hr, also at a pressure of 65 p.s.i.g. The turbines drive the 1,750 kW water-cooled compound-wound 220 V generators through epicyclic planetary-type gearing, the turbines running at 6,250 r.p.m. and the generators at 550 r.p.m. The generators are of the totally-enclosed type, but have the twin commutators open for ease of maintenance. In addition, two Allen self-contained emergency diesel generators are installed, each unit comprising a four-cylinder, four-stroke pressure-charged engine directly-coupled to a 200 kW 220 V d.c. generator running at 700 r.p.m. A 220 V 320 Ah nickel-cadmium alkaline battery of 184 cells has also been provided for emergency use, and there are two 20 cell batteries, each comprising a 24 V 275 Ah unit, for providing a low voltage supply to various services including telecommunications. All have been manufactured by Britannia Batteries, Ltd.

These two power sources are connected to an emergency switchboard which comes into operation automatically. First the battery is connected enabling the emergency lighting and steering way on the vessel to be maintained until the emergency generators take over and supply the emergency circuits required by Lloyd's and the Ministry of Transport. The main switchboard is sited adjacent to the four turbo-generators in a machinery com-

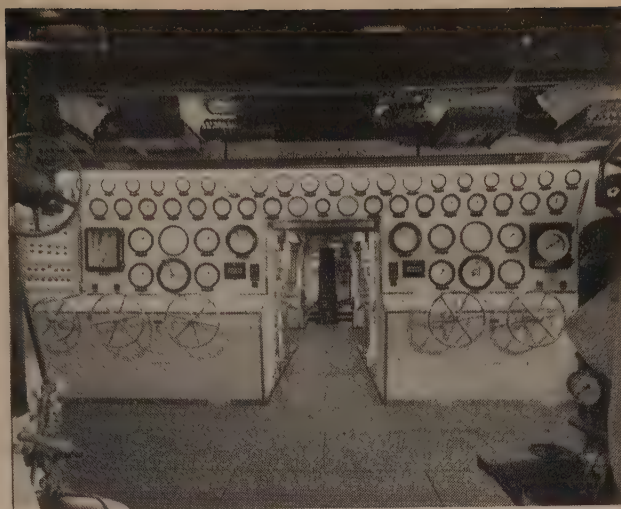


partment separate from the main engine room. The dead front pattern switchboard is 65ft long and distributes current to 22 auxiliary switchboards throughout the ship. The main, emergency and auxiliary switchboards were supplied by Whipp & Bourne, Ltd.

Approximately 400 miles of cables are used, many of which are multicore cables having up to 43 cores. Hard drawn copper busbars connect the four 1,750 kW generators to their respective breakers. If cables had been employed, ten 1 sq in cables per pole would have been necessary. The main cables throughout the ship are generally 660 V grade varnished cambric insulated and lead covered. Some of the smaller sizes of mains cables are rubber insulated and lead covered. For general lighting the cables are rubber insulated and fire resisting compounded, and are generally run in fire proofed wood casings in the accommodation.

Amongst the pump units installed are four 200 h.p. main circulating pumps (16,500/24,000 gal/min), three 58 h.p. auxiliary circulating pumps (5,000/6,100 gal/min), two 70 h.p. sanitary pumps (1,120 gal/min), three 64 h.p. and one 31 h.p. salt-water circulating pumps (3,334 and 6,100 gal/min) for refrigerating machinery, and three 68 h.p. air-conditioning brine-circulating pumps (2,000 gal/min). Other motor applications include broadside manoeuvring units (four 550 h.p.); the Howden induced-draught (four 430/62 h.p.) and forced draught fans (four 244/31 h.p.); and the Denny Brown main, servo and auxiliary stabiliser gear (two 60 h.p., one 15 h.p. and one 5 h.p.).

Automatic turning gear manufactured by A.E.I., Ltd., is provided to turn the rotors of the main turbines at a very low speed, corresponding to one revolution of the propeller in ten minutes, preventing the shaft distortion that may occur if the rotors were allowed to cool or warm up in a stationary position. The mechanism consists of an electric motor connected to one of the turbine pinion shafts through a combined spur and worm reduction gear and a toothed

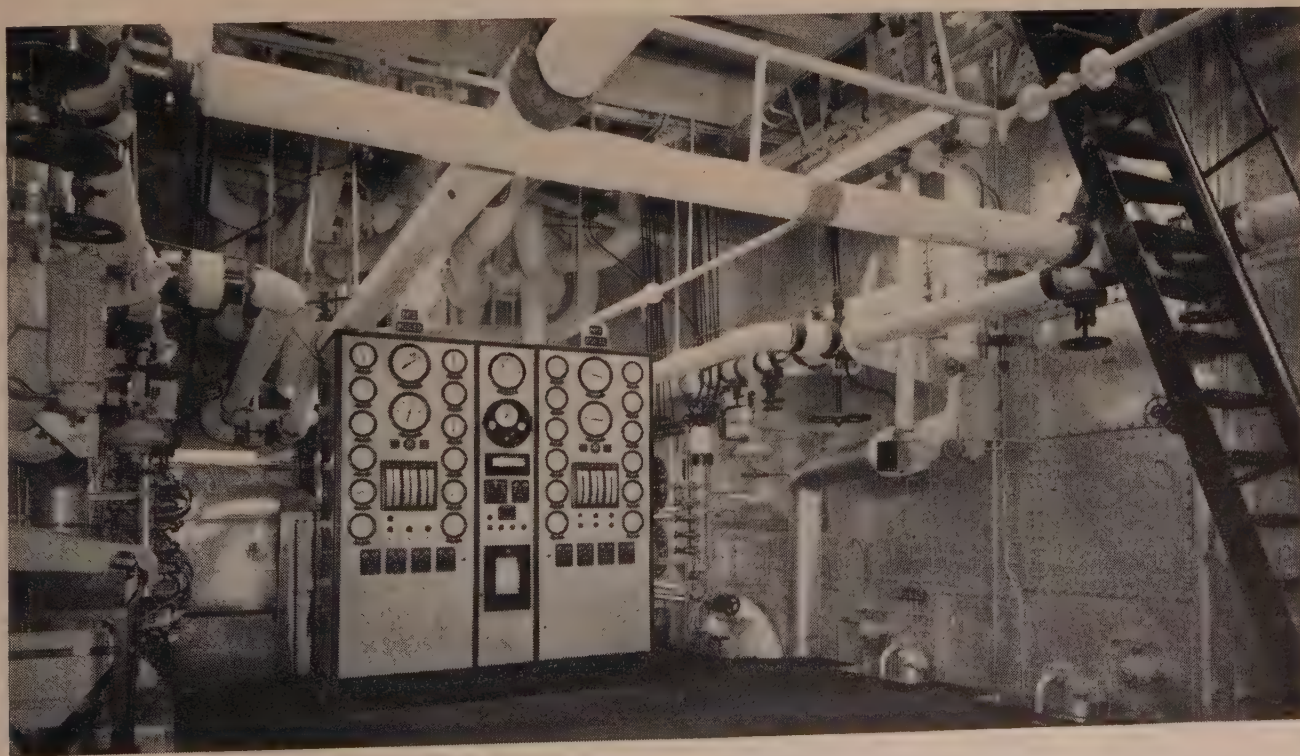


*Starting platform for the ship's main turbines*

clutch. Complete clutch engagement is ensured by a relay system. Interlocks are incorporated to ensure that the gear cannot be engaged unless the turbines are at rest, and that steam cannot be admitted to the turbines unless the turning gear is disengaged. Also supplied by A.E.I. are four centrifugal compressors driven by single-stage turbines incorporated in the J. & E. Hall air-conditioning plant. Each compressor is rated at  $5\frac{1}{2}$  million B.Th.U./hr at 5,150 r.p.m.

Lighting in public rooms consists mainly of hot-cathode fluorescent tubes concealed in cornices and recessed fittings supplied by G.E.C. With an electrical loading of 185 kW spread over some 60 public rooms and entrances, this indirect lighting installation is thought to be the largest of its kind afloat. G.E.C. have supplied nearly 14,000

*A control panel for the Foster-Wheeler boilers in the boiler room*







The fluorescent lighting is supplied from three 300 h.p. 200 kW Laurence, Scott & Electromotors, Ltd., motor-alternator sets

fittings of about 100 types. In addition, the company has been responsible for the telephone exchanges and equipment, fire alarm system, and room switches and pushbuttons. There are two telephone exchanges, one automatic for use by the crew with a capacity of 150 lines although initially equipped with 120 lines, and a two-position manual switchboard with 480 lines (maximum capacity 500) for passengers and passenger services. Three tie lines allow intercommunication between the two exchanges. Provision has been made for 12 ship-to-shore lines when the ship is in port. A fire alarm indicator on the bridge is connected to 50 alarm buttons installed at strategic points in the ship. Other lighting fittings were supplied by A.E.I. Lamp & Lighting Co., Ltd., Wm. McGeoch & Co., Ltd., and the Z Electric Lamp & Supplies Co., Ltd.

There are 13 lifts of varying types, including four 12-passenger lifts which serve the first class passengers and two eight-passenger lifts in the tourist accommodation. A fast lift has been installed to take the engineers direct from their accommodation to the engine room some 40ft below. There are three store lifts each capable of taking a load of a ton, two serving ten decks. All the lifts are of J. & E. Hall manufacture.

The vessel is equipped with a co-ordinated internal and off-air television service supplied by the Marconi International Marine Communication Co., Ltd., on behalf of Marconi's Wireless Telegraph Co., Ltd. The installation provides for the reception of television broadcasts employing the 405-line system used in Britain, the 625-line system used in Australia and the greater part of Europe, and the 525-line system used in the United States, Canada, and Japan. Initially, some sixty receivers will be installed, and provision is being made for increasing the number up to a maximum of nearly 400 later.

Other sub-contractors included: Cable, busbars and cable fittings—British Insulated Callender's Cables, Ltd.; W. T. Glover & Co., Ltd.; Pyrotenax, Ltd.; Standard Telephones & Cables, Ltd.; and Vosper, Ltd. Switchgear—British Klockner Switchgear, Ltd.; Britmac Electrical Co., Ltd.; and Santon, Ltd. Motor-generators—Laurence, Scott & Electromotors, Ltd. Power and lighting fuse boxes—Clifford & Snell, Ltd. Razor sockets—Chilton Electric Products, Ltd. Charging resistances—Curtis Manufacturing Co., Ltd. Electric thermometers—Elliott Brothers (London), Ltd. Rudder indicator—Evershed & Vignoles, Ltd. Cranes—Fuller Electric, Ltd. Stores hoists—Taylor Stoker Co., Ltd. Bells—Gent & Co., Ltd. Heaters—Heatrae, Ltd. Fire-fighting equipment—Mather & Platt, Ltd. Integrating power meters and ship stabiliser control equipment—Muirhead & Co., Ltd. Trailing anode cathodic protection equipment—Sunderland Forge & Engineering Co., Ltd.

## New Books

**Servomechanisms.** By P. L. Taylor. Pp. 418; figs. Longmans, Green & Co., Ltd., 6/7, Clifford Street, London, W.1. Price 42s.

This further addition to the list of textbooks on servomechanisms represents a worthwhile contribution. The author is a practical worker in the subject, and his approach is stimulating throughout. The volume is divided into three parts, and after the first introductory section basic components are discussed in detail, with informative chapters on rotary amplifiers, phase-sensitive rectifiers and miscellaneous drives. These first two sections adequately cover all the non-analytical techniques of linear servomechanisms and are concluded by the formulation of the overall transfer-function of the system. Mathematical techniques are fully discussed in the final section, which introduces complex variable theory, the Laplace transform, and thence the Root-Locus method and the Nyquist diagram.

As a direct consequence of the late introduction of the necessary mathematical tools, many transfer functions are derived before their significance can be appreciated, and

this is perhaps the most unsatisfactory feature of the volume. However, there is little agreement on the best way to present servomechanism theory, and the book merits consideration as a text for Honours degree students. Each chapter is accompanied by numerical questions with answers, and the publishers are to be congratulated on their production of this substantial volume at such a reasonable price.—J.L.D.

**The Antenna.** By L. Thourel. Pp. 407; figs. Published by Chapman & Hall, Ltd., 37, Essex Street, London, W.C.2. Price 70s.

This book is based on a course given at the French School of Civil Aviation and is written to assist engineers and technicians in planning an antenna system to specific requirements. Mathematical argument has been reduced to the minimum and the practical equations given are supplemented by measurements taken in developing actual antennæ. There is an emphasis on microwave antennæ, particularly those for radar, but even so types for other wavelengths are fully treated. This translation is by H. de Laistre Banting.—T.R.W.



Summary of a paper entitled "A Survey of Street Lighting and Its Future" by W. R. Stevens, B.Sc., M.I.E.E., and H. M. Ferguson, A.M.I.E.E., given before an ordinary meeting of the Institution of Electrical Engineers on 1st December



Fig. 1.—The effect of road surface on a street lighting installation

## STREET LIGHTING

By H. M. FERGUSON, A.M.I.E.E.\*

**T**HE purpose of street lighting is to improve the amenity and safety of the roads at night. The object in main road lighting is to produce a bright road surface and surrounds against which pedestrians, cyclists, etc., will be clearly seen in silhouette from the drivers' viewpoint: the emphasis is on safety. Side street lighting, on the other hand, is mainly for the pedestrian and the householder: the emphasis is on amenity and, since the quantity of light is very limited, the motorist should use his headlights where necessary.

Street lighting in this country is covered by the British Standard Code of Practice C.P. 1004: Parts I and II, which lays down the amount of light required, the height and spacing of the lanterns and the various types of light distribution which may be used. For main roads, the lanterns are normally mounted at a height of 25ft and spaced about 120ft apart on alternate sides of the road. Each lantern produces a bright patch on the road surface whose size and shape is largely determined by the nature of the road surface and partly by the light distribution from the lantern. A complete installation is built up of lanterns so arranged that their bright patches marry together: an observer moving along the road will see continuously before him a bright surface against which objects on the road are silhouetted.

Three types of lighting are recognised in each of which the light distribution from the lantern, in a vertical plane parallel to the road, is broadly defined. The high-angle-beam distribution, which produces high intensities right up to the horizontal, is intended to result in a bright patch with a long tail extending towards the observer so that the best uniformity of road brightness can be achieved with considerable spacings (120-150ft) between lanterns. Unfortunately, the high intensities just below

the horizontal cause considerable glare. The cut-off distribution, in which very little light is emitted above about  $10^\circ$  below the horizontal, produces negligible glare, but the bright patch is now severely curtailed and appears as a narrow band extending across the road: the penalty is a much closer spacing (90-100ft) if reasonable uniformity of road brightness is to be achieved. Cut-off lighting is little used in Britain on account of its cost. The medium-angle-beam distribution lies between the other two. Reasonable uniformity is normally obtained with a spacing of 120ft and the glare is moderate. An installation is, broadly speaking, planned as a compromise between glare, patchiness and cost.

### Effect of Modern Road Surfaces

Since the Code of Practice was published, road engineers, in their enthusiasm to produce non-skid roads, have been laying surfaces which are so rough and dark that the individual bright patches have shrunk to a fraction of their former size. The resulting installations are patchy and of lower average brightness, so that glare has been increased, sometimes to an unacceptable level.

An installation of sodium lanterns is shown in Fig. 1; in the background can be seen the excellent lighting on the old road surface while in the foreground can be seen the effect of the new dark surface.

The situation has been aggravated in the last few years by some rather foolish price cutting by manufacturers of street lighting equipment. As a result, many lanterns are now giving a poorer performance than their counterparts of a few years ago so that glare and patchiness have further increased. This deteriorating situation has not

\* Research Laboratories of the General Electric Co., Ltd., Wembley.



been discouraged by the central authority which normally insists that financial assistance for a street lighting scheme will be considered only if the local authority accepts the lowest tender. Parsimony seems hardly justified, however, remembering the results of experiments and statistical analysis made by the Road Research Laboratory. These indicate that good street lighting reduces night accidents by about 30 per cent, and there is a widely-held view that the saving in cost of these accidents would pay for the lighting.

Side street lighting is often a scaled-down version of a main road system. This is usually wrong: experiments made over five years ago indicate quite clearly that there are better ways of dealing with this particular problem. We are often very slow to take advice from the latest technical developments.

Our street lighting costs about 2d per head per week and it is evident that for an almost insignificant increase in net expenditure we could have had greatly improved lighting in our roads.

We have much to learn from experiments on unconventional systems and also from other countries where, in many ways, practice is ahead of ours. We need to be more generous both in imagination and money.

## DISCUSSION

The discussion was opened by Dr. J. W. T. Walsh who said that street lighting was dominated largely by the code of practice drawn up to codify the recommendations of a Departmental Committee which reported in 1937. Compared with 1937 the power for road lighting cost only one-twentieth in real value, the traffic had altered, the roads themselves had altered, and the nature of the road surface had undergone profound modification. There would have to be a lot of new thinking about the best way to light the streets. He criticised the present financial arrangements for the provision of street lighting, and expressed the hope that the obstacles would be removed.

Mr. H. R. Ruff (A.E.I.) said that in a test with mercury and sodium lamps with identical optical systems, 50 per cent of the observers found the mercury lamps more glaring and 50 per cent found no difference. Sodium was thus favoured. He felt that there was some danger of the British suddenly looking at the Continentals and saying "How much better they are. They have had cut-off lighting for years," and the Continentals coming to Britain and saying "How much brighter the British installations are," and of the two even crossing over.

Mr. H. Jackson gave details of a lighting scheme installed about a year ago on a dual carriageway by-pass through a suburb of Cardiff. The units were 200 W sodium lamps in medium angle lanterns, and the spacing was an average of 160ft with a mounting height of 35ft, giving a spacing-height ratio of 4.5:1. The light output was 9,600 lumens per roo ft linear. The cost was £6,000 per mile. He had used the road under both wet and dry conditions. In view of the high quality of the lighting and the general comfort for the driver and the ease with which he could see objects in silhouette, coupled with an absence of glare, he felt that any expenditure on raising the light output to the figures mentioned in the paper—between 10,000 and 20,000 lumens per roo ft linear—would scarcely be justified.

Mr. S. S. Beggs urged members of the Institution to use their influence with local authorities on every occasion to spend adequate amounts of money on street lighting. He wondered whether those concerned were not putting too much emphasis on having non-skid road surfaces and forgetting that one must be able to see well at night, and he questioned whether sufficient attention had been paid to intermediate surface materials.

Mr. F. C. Smith said that the scene was changing; many factors were coming together and there was a sense of urgency that there must be improved lighting in the near future. The traffic density had increased and road engineering problems were being completely changed. Also, the road accident rate was going up. They knew full well that they could reduce the accident rate by about 30 per cent at night if the lighting was raised to the order of that of Class A roads. All those matters demanded urgent attention.

Mr. J. F. Pickup said that tests had shown that sodium lighting tended to give about 14 per cent better visual acuity than high pressure mercury, and high pressure mercury about 9 per cent better than tungsten, and fluorescent and fluorescent high pressure mercury about 4.5 per cent better than tungsten. From the safety point of view, even a 5 per cent increase in perception was worth having.

Mr. H. M. Ferguson, replying to the discussion, said that there were at the present time so many lighting authorities in the country that if each one were to put up a single street lighting lantern (to the Code of Practice, one would hope) the installation would extend from London to York. That was an indication of the problem with which the country was confronted. He was not decrying the efforts that were being made by the lighting authorities. On the contrary, he sometimes wondered how it was that they did so well in such difficult circumstances. He emphasised that what was wanted was uniformity of quality of lighting rather than uniformity of light source. Indeed, they did not particularly want to have uniformity of the type of light source or the type of light distribution. Variety was the spice of life even in street lighting, provided that it was kept within reason.

While there seemed to be something about sodium lighting in fog (perhaps it was its warmth) there was absolutely no evidence at all that it gave better visibility. Some people were still under the impression that sodium light penetrated fog better than mercury. He could assure those present that this was not true.

## Resistors for Electronic Equipment

THE latest in the series of British Standards dealing with components intended primarily for use in telecommunication and allied electronic equipment, B.S. 2111, is divided into two parts, the first (now available) specifying requirements and tests and the second (to be published later) comprising a list of standard sizes and ratings, for fixed wire-wound resistors. The specification applies to insulated and non-insulated fixed resistors consisting of a winding of resistance wire on a heat-resisting former, and having a dissipation at 70°C not exceeding 200 W and a rated resistance value not greater than 200,000 Ω. Precision wire-wound resistors are excluded from the standard.

Copies may be obtained from the British Standards Institution, 2, Park Street, London, W.1, price 10s.



# Transformer Core Production

Transformer core laminations up to 15ft long are produced in pairs from coiled steel strip on an automatic machine recently commissioned at the Hollinwood, Lancs, transformer factory of Ferranti, Ltd. The company has also been investigating the causes of noise in transformer cores and has developed a core giving good steel utilisation and a low noise level

A FULLY automatic core plate cutting machine which can produce core laminations from continuous rolls of steel has recently been installed in the Transformer Department of Ferranti, Ltd., at Hollinwood, Lancs.

Until the advent of grain oriented cold rolled continuous steel strip, core production was limited by the size of hot rolled electrical sheet steel which could be supplied by the steel manufacturer, i.e. a maximum plate size of 9ft by 3ft. With the introduction of cold rolled steel in continuous coils, a plant development programme was started to introduce some measure of automation to core plate production, to improve the limits to which core plates could be produced and at the same time overcome difficulties in handling.

To deal with the continuous coils of steel supplied by the manufacturers, special purpose rotary guillotines or slitting machines were developed, the first being installed in 1955. This reduces the width of the coil to that required for core laminations or plates. The machine consists of a de-coiler which allows the coil to unwind and pass through the rotary cutting head, where it is slit into strips of the required width, to the re-coiler where the individual strips are re-wound. This machine can handle coils of up to 3 tons

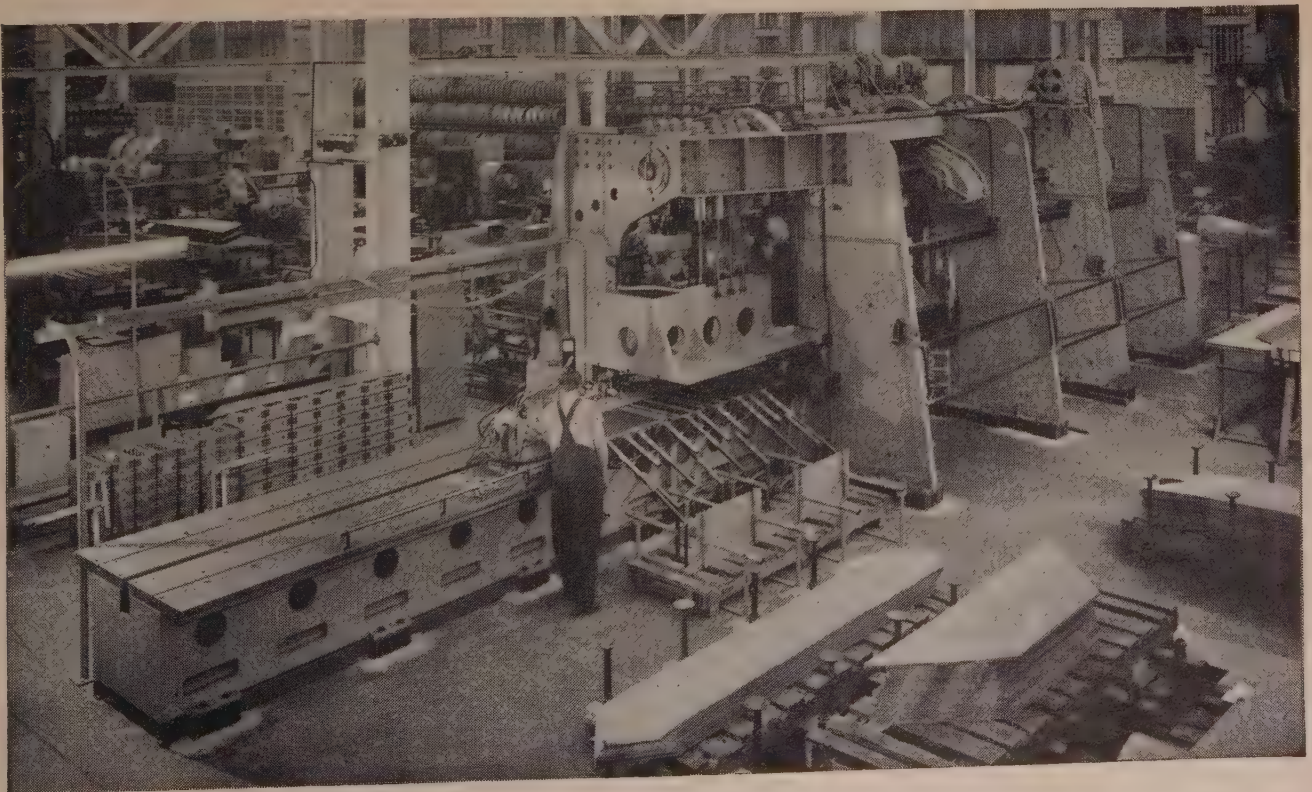
weight and from  $3\frac{1}{2}$  to 36in wide. A maximum of eight strips can be cut at once and strips down to  $1\frac{1}{2}$ in wide can be produced.

The continuous strip was, until the installation of the new core plate cutting machine, reduced to the lengths required on conventional guillotine machines with subsequent press operations for the punching of holes and slots and edge grinding to remove burrs.

The new machine combines in one operation the piercing of all holes or slots and the cutting of two plates per machine cycle. Provision is also made for grinding off edge burrs, if necessary. All dimensions are related to the theoretical centre line of the strip which is also that of the core. This divides possible inaccuracies in the width dimensions equally to both sides of the plate. The possibility of variations in length dimensions have been eliminated by cutting both ends of each plate and punching all holes and slots in one operation of the machine while the strip of material is in tension.

The machine is fed automatically to cut laminations two at a time, each up to 15ft by 36in wide but a special facility catering for laminations up to 47in wide has been incor-

*The fully automatic core plate cutting machine. Only one of the two plates cut at each operation is ejected on this side*





porated. The bed of the press is 30ft long and 4ft 8in wide and the ram carries two sets of punches and end forming tools. After the tools for end cutting and hole or slot forming are set, the de-coiler is loaded and with the machine under hand control the material is fed round a swinging arm and through two pairs of feed rolls until the leading edge is beyond the first end forming tool. The machine is operated by foot control and one set of holes or a slot is pierced and a 45° mitred end formed. The piece of scrap material lying beyond this end is removed and the press switched to automatic control.

The feed rolls now automatically pass the strip under the piercing and end forming tools. When the swinging arm is pulled sufficiently far from the at-rest position, a photo-electric cell is illuminated and the de-coiler operated, thus supplying more material to the feed rolls. As the leading edge of the material interrupts a second photo-electric cell at the other end of the machine the rate of feed is cut from 200 to ½ft/min until the leading edge hits a microswitch in a hydro-pneumatic press unit, which operates and punches a small anchor hole in the material, the punch remaining through the material. The action of punching the anchor hole immediately opens one pair of the main feed rolls and causes the other pair to reverse, thereby pulling out any ripples there may have been in the material.

This tensioning continues until the electric clutch through which the rolls are driven starts to slip, when a hold-down ram in the feed roll unit operates and holds the material in the tensioned condition. The reversing rolls return to the disengaged position and the ram operates, cutting and piercing two complete plates. As the ram rises all side stops are lowered and the piercing tool is withdrawn, starting the ejection mechanism which ejects one complete plate on each side of the machine where they are automatically stacked. The cycle is then repeated.

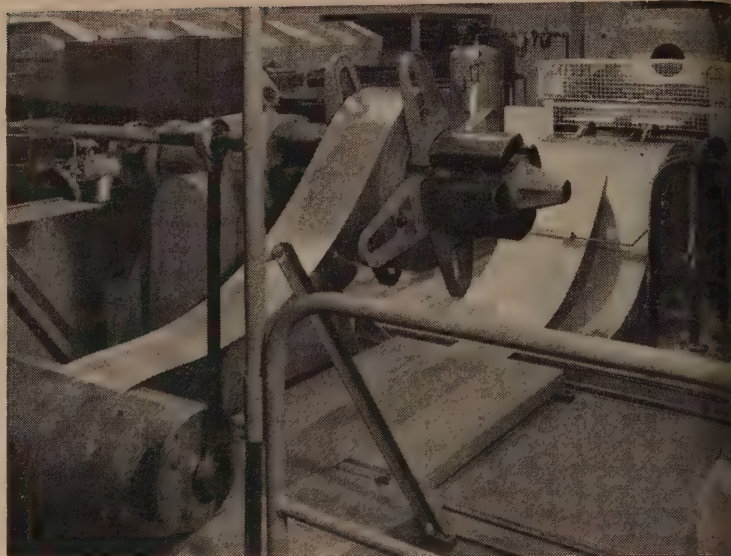
The overall length of the machine is 60ft and the total weight is 60 tons. From 360 to 480 plates can be cut per hour. The plant has been in production since July, 1960.

The machine was designed and developed by Ferranti engineers and manufactured by A. Kinghorn & Co., Ltd., Todmorden; Humphries & Sons, Ltd., Poole; and the Norbury Engineering Co., Ltd., Hyde, with ancillary equipment by Ferranti, Ltd.

### Core Noise Research

Practically all the noise emanating from a transformer arises in the core which vibrates in a complex manner due to the magnetostriction effect of the silicon steel and mutual repulsion or attraction of the laminations. When we visited the transformer factory last week to see the new core cutting machine we were also shown a film describing some of the recent research carried out into this problem.

Magnetostriction is the relative change of dimension of a material in the direction of magnetisation and this change can be either positive or negative. The polarity of the magnetic field is immaterial, the positive and negative half-cycles of current and the magnetic fields which they produce having the same effect on the core shape. With increasing flux density, the magnetostriction will, in general, increase, but may in some instances reverse. The magnetostriction varies throughout a batch of nominally identical material and even throughout a single sheet. It can be of the order of a few parts in a million and its frequency is



*De-coiler end of the new machine. When the swinging arm in the foreground is moved as the strip enters the machine a light beam falls on a p.e. cell, controlling the de-coiler motor*

normally twice the excitation frequency. Mutual attraction occurs between adjacent laminations when flux passes from one to the other and repulsion occurs when flux leaves or enters two or more adjacent plates simultaneously. As the maximum effect occurs at maximum flux, these phenomena also take place twice per flux cycle.

There are two effects causing vibration with a fundamental frequency of twice that of the flux cycle and the total effect is a complex vibration pattern in the core. There is a cyclic change in the length of the leg and yoke due to magnetostriction and a flapping motion of the laminations where flux leaves and enters at the joints or other places where a change of permeability causes this transfer. There is also another effect taking place in individual laminations in which either permeability changes from place to place, making the flux density change and hence the magnetostriction, or where the magnetostriction itself is not uniform within the sheets, causing buckling. There are other additional factors such as the motion at a corner where leg and yoke in effect collide, and the buckling of a leg or yoke considered as a strut, due to the stress caused by its extremities being accelerated with respect to the centre.

All these motions are very small compared with the size of the core (measurements taken on a 60 MVA core show r.m.s. displacements of the order of 0.0001in), but they produce the noise associated with transformers. In general the sound level generated increases with the size of transformer and flux density.

The factors causing vibration can be summarised as 1, longitudinal vibrations due to pure magnetostriction and, 2, transverse vibrations due to (a) factors of design which cause flux transfer from plate to plate, (b) variations in permeability from place to place on laminations and (c) variations in magnetostriction from place to place in laminations. Of these only 2(a) is in the hands of the transformer designer, and it is possible to eliminate flux transfer from plate to plate. The other factors are related directly to the steel manufacturing process, and whilst a material having zero magnetostriction can be made by the addition of about 6 per cent silicon, it is too brittle for practical use.



To try to prevent vibration by sheer force of constraint is not really practicable as the forces set up in the core are large. In the leg of a 10 MVA core of, say, 150 sq in area, this force could amount to 12,000 lb.

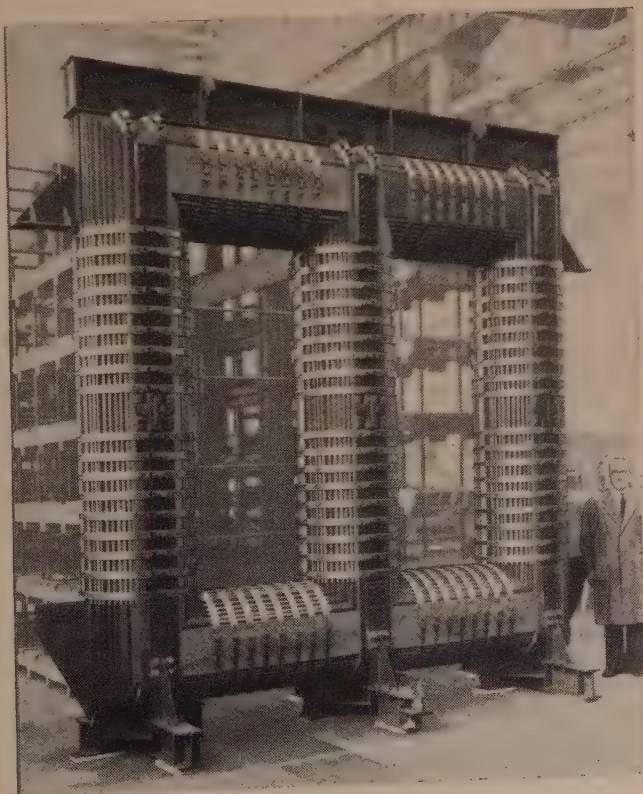
If the longitudinal vibrations were uniform, the centre of the core leg would be a nodal point with no vibrations, and if the core could be supported from this point, there would be minimum direct transmission to the tank. The vibrations are so complex, however, that this nodal point is ill-defined or even absent. In practice, the reduction in noise transfer is disappointing, but improvements in the uniformity of the core material will increase the value of this construction, although even if the nodal support were to eliminate entirely the transmission of vibrations through the supports, the parallel path through the oil is left unrestricted.

Tank design plays a part in the amount of sound power radiated. If the tank or any of its components of a 50 c/s transformer has a resonant frequency near 100 c/s or a multiple thereof, it will actually increase the noise level. In some cases a reduction can be achieved by interposing anti-vibration mountings between tank and foundation. The final remedy is to enclose the transformer partially or completely. Enclosures can be designed to give up to 35 dB attenuation.

### Backbone Core

The core illustrated incorporates four features—backbone, banding, balancing and mitring—to give a more efficient utilisation of cold rolled grain oriented steel and to improve the noise characteristics based on the above considerations. This required elimination of bolt holes, use of mitred corners, uniform pressure, prevention of cross-fluxing and suspension at nodal points. At points on the

*The backbone constructed core designed for good steel utilisation and low noise*



backbone, keyplates are welded on to the backbone to form a "hanger" from which the leg laminations are suspended. A steel stiffening plate is positioned over the outside leg laminations, which extends over the whole length of the leg, partly covering the top and bottom corners and being centrally located by a locking plate. The stiffening plate also serves to carry some of the top and bottom coil supports and contributes to the rigidity of the structure when the complete transformer rests on its backbone.

Because the entire core is thus hung on the backbone of each leg, the magnetostrictive vibration would be a minimum for reasons of symmetry. This reduces the amount of noise transmitted directly from the core to the tank bottom.

### Laminations

The laminations are held in place by steel bands which encircle the legs and yokes and are insulated from the core by circumferential strips of pressboard. The bands are positively located longitudinally by slotted strips which also serve as location points for the windings and relieve mechanical pressure on the band insulation at those points. Two insulated sections are included in the steel bands and screw adjustment is provided to adjust each band tension. The bands are not used to pull the core tight, but the latter is compressed under hydraulic pressure to a pre-determined value and the bands are fitted and tightened with the core in this position. As the amount of core compression affects the noise level, correct tension is essential. The insulation between the half bands and between bands and core will withstand a routine 2,000 V, 50 c/s pressure test and impulse voltage up to 25 kV.

The joints between leg and yoke laminations are mitred, with alternate joints off-set to provide the necessary overlap. The minimum off-set is  $\frac{1}{2}$  in, the actual value depending upon the size of core and space required for the pins. These metal pins are insulated (or are entirely of insulating material) and serve to suspend the bottom yoke laminations from the leg laminations. They are positioned in the area of overlap and can be made small in view of the very low stresses produced in them. This is because bending moments and shear forces are produced by only 2 or 4 laminations acting alternately upwards and downwards across very short spans. The leg and yoke sections are identical in shape, each step in the yoke being of the same area as the corresponding leg step. This minimises "cross-fluxing" and consequently reduces iron loss, magnetising VA and noise.

In large cores cooling ducts are provided parallel to the laminations to give the desired value of heat gradient. In very large cores where the width of the available steel is insufficient, the leg or yoke width is made up of two laminations of unequal width placed side by side and overlapped every other layer. The narrower laminations are supported by pins.

### Copper Alloys

Professor W. Hume-Rothery, O.B.E., F.R.S., of Oxford University, is to give a lecture on "The Theory of the Alloys of Copper" under the auspices of the Metal Physics Committee of the Institute of Metals at the Royal Institution, Albemarle Street, London, W.1, on Thursday, 23rd February, at 6.30 p.m.



## PARLIAMENTARY REPORT

IN the House of Lords the Joint Parliamentary Secretary, Ministry of Transport (Lord Chesham), reaffirmed the Government's intention not to publish the recommendations of the Stedeford group about British Railways. He was answering a question from Lord Morrison of Lambeth who also asked how the plan for modernising and re-equipping British Railways would be implemented, to which Lord Chesham replied that the Minister was expecting shortly to receive from the British Transport Commission a four-year programme on which they had been urgently engaged for some time. As soon as it had been received and examined the Minister would discuss its implementation with the Commission in the light of present and probable future needs.

Lord Morrison asked when the "report" of the Stedeford group was received and why it was proposed not to publish it. This was, he said, a matter of public interest whether it concerned a publicly-owned or a privately-owned industry. Lord Chesham said he was a little surprised that the question had been asked since it had been made clear by Ministers on four occasions that publication was not intended. There was some misapprehension in that the group had made recommendations; they had not made a "report" at all.

There seemed, he continued, to have been a good deal of inaccurate thinking about the group which was set up to advise the Minister and the Commission and the recommendations they made from time to time were sent to both at the same time. What mattered to Parliament was the proposals that the Government, after consideration and consultation, would put before Parliament and they would be forthcoming in due course. He added that when the group was set up it was made clear that their recommendations would be confidential; the group undertook their work in that light and witnesses gave evidence to them on that understanding.

When Lord Morrison and the leader of the Labour peers (Viscount Alexander of Hillsborough) sought to show that it would be impossible to debate the Government's proposals without knowing what led to them, Lord Chesham said it had long been accepted that Ministers made statements to Parliament on their own responsibility and were responsible for justifying them. It was their conclusions Ministers had to justify and not the advice they received.

Lord Stonham asked whether the new decision to ask the Commission for a four-year plan had anything to do with the recommendations of the Stedeford Committee. Lord Chesham said the Minister and the Commission were discussing the matter when the group was set up and while their recommendations were certainly under discussion, he could not honestly say that the whole thing stemmed from them.

### Fuel Requirements

The Minister of Power (Mr. Wood) said, without claiming precision for such forecasts, he expected the annual inland energy requirements to be about 300 million tons of coal-equivalent in the later 1960s. The shares of the various sources of energy in the total would depend on their competitive ability.

### Holme Pierrepont Inquiry

When the public inquiry into the plan of the Central Electricity Generating Board to build a large power station at Holme Pierrepont (Notts.) was resumed last week Mr. G. Guest, for Nottingham Corporation, said pollution, fog and wind direction made the site "by far the worst in the country." He claimed that fog occurred once every 10 days in the Nottingham area and that the wind blew from the site in the direction of Nottingham on 105 days in the year.

Mr. Glyn England, the C.E.G.B.'s development engineer on policy, said that if the power station used 10 million tons of coal a year, then 180,000 tons of sulphur dioxide would be discharged into the atmosphere annually. He calculated this would fall about two miles from the station and he said that £2 million was to be spent on anti-pollution measures. The gases from 650ft chimneys would be expelled upwards at about 35 miles per hour, and at high output no black smoke would be produced. The cleaning plants would be 99.3 per cent efficient.

### Electricity in Borrowdale

People living in Borrowdale Valley, a beauty spot in the Lake District, who have been waiting for many years for electricity supplies were assured by the Minister of Power (Mr. Richard Wood) last week that he would try to speed up an inquiry into the matter. The Minister was attending a meeting

of the North Western Electricity Consultative Council.

Ald. R. Townsley, of Workington, chairman of the Western Lakeland District Committee, said they were very disappointed that certain people who only visited the area once a year could make decisions which could disrupt the path of progress. People who earned their living and lived in the area should have the benefit of electricity. The Minister said that he was aware of the frustration caused by objections made by people living some distance away.

Mr. T. E. Daniel, chairman of the North Western Electricity Board, said that they hoped to complete electrification there in less than five years but if they had to install underground cables instead of overhead lines it would double the cost per consumer and slow things down.

### WALKING DRAGLINE

Erection of one of the world's largest walking draglines has begun at the Roxby opencast ironstone mine, Scunthorpe, of the Ore Mining Branch of the United Steel Companies, Ltd. This £900,000 machine will weigh about 1,850 tons and with its 303ft-long fabricated boom and 25 cu yd bucket it will be capable of stripping up to 30 tons of overburden at each "bite," shifting its own weight of material every hour. It can be entirely controlled by one man.

The W1800 dragline, designed and built by Ransomes & Rapier, Ltd., is electrically driven, taking power at 6.6 kV through a trailing cable to feed two 1,500 h.p. motor-generator sets. These sets in turn provide direct current to the 14 main driving motors, each of 225 h.p. All the electrical equipment is housed in a machinery house, which is 53ft wide and 90ft long, and serviced by an overhead electric crane with two 10 ton crabs.

The revolving superstructure of the machine is supported on a 55ft diameter circular base, and the walking mechanism consists of two walking shoes, one on each side of the machine, each 55ft long by 9ft 6in wide. The shoes are carried on vertical legs which are driven by eccentrics, enabling the machine, by means of lifting and tilting, to "walk" in 7ft 7in strides at a rate of 0.11 m.p.h.

The 303ft long boom is of lattice and girder construction in high tensile and mild steel, permitting the machine to shift its fully loaded bucket of 52 tons over a distance of 560ft and to dump it up to 130ft above the level on which the machine stands.





Part of the new general test room

## Instrument Test Room

A NEW test room has recently been completed at the Dalston, London, works of Nalder Brothers & Thompson, Ltd. A specially built conveyor transports all instruments from the assembly bays in the works to the test room and is used also for the transit of completed instruments from test room to dispatch department. Cables have been installed in ducts below the test room flooring and all testing circuits are made by twin or multiple cables connected by plugs and sockets on the test benches for connection to standards and instruments for calibration. Power supplies from both main and independent special machines such as frequency changers are available on most benches. This cabling system eliminates connection errors, and all test benches are clear of wiring.

Control of all supplies for calibration and testing is mainly by push-button remote control, since the machine units for power supply, etc., are installed in special rooms, outside the test department where they can be easily inspected for maintenance. The test room is fitted with 40 test desks complete with all instruments, each specially

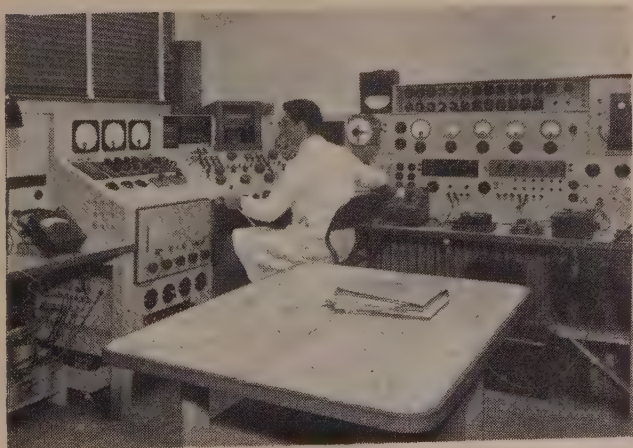
designed and constructed for the various instruments made by the company and allocated in special sections. These include the calibration and testing of instruments and relays, individual scaling and accurate printing of instrument scales, and the calibrating and testing of sub-standard instruments. For instruments which are ordered for service under various climatic conditions, a special humidity cabinet has been installed. A motor driving four three-phase generators, namely a voltage generator, a frequency doubler and a current generator with its own frequency doubler, has been installed for high-frequency and three-phase calibrating and testing. The unit has a range of 100 to 800 c/s with complete phase angle control from zero lag to zero lead.

### Galvanised Cable Armouring Wire

NOW that it has been revised, "Galvanised Mild Steel Wire for Armouring Cables," B.S. 1442: 1960, applies only to wire used primarily for the armouring of land cables for electrical purposes. Requirements for the armouring of submarine cables have been transferred to B.S. 1441, to be published soon. In the 1948 edition of B.S. 1442, the resistivity of the wire was stated as an ohm/mile constant but it was not a specified requirement. With the increasing use of non-metallic sheathed cables in which the wire armour serves as the sole earth continuity conductor for certain purposes and types of cables, the resistance of the armour becomes important. Therefore there is a clause in the revised edition stating that for certain purposes and by agreement between purchaser and manufacturer, the d.c. resistance of the galvanised wire shall be measured.

The standard applies to fully galvanised mild steel round wire in sizes ranging from 0.160 to 0.018in. Tests and tolerances are specified and details are provided relating to the preferred sizes, the selection and testing of samples, re-tests, galvanising, resistivity, and packing and identification. Copies may be obtained from the British Standards Institution, 2, Park Street, London, W.1, price 4s.

A corner of the sub-standards test room





# Transformer Manufacturers' Agreement

The Restrictive Practices Court has continued the hearing of the case of the Associated Transformer Manufacturers' Agreement which, the manufacturers claim, has operated in the public interest and to the advancement of export trade. Earlier proceedings have been reported in our last two issues

**I**N the course of his evidence Mr. R. M. Charley said that today the English Electric Co. was working at only 63 per cent of its transformer capacity, as compared with 92 per cent in 1959. He believed that that was typical of the present widespread excess capacity in the industry, which was due to the sharp decline in exports, yet he considered that future demand for transformers would be very great because world electrification would proceed at a greater rate than in recent times. It was, therefore, essential to preserve the industry's capacity to meet future demand. If the agreement were abrogated prices would be forced down because of the excess capacity to wholly uneconomic levels and some manufacturers might be forced out of business. If uneconomic prices persisted for a long time the English Electric Co. would have to consider giving up the manufacture of transformers. In any event, uneconomic prices would cause manufacturers to curtail the important work they were doing in research and development, and designers would have to "tailor" design to fit the price.

There was the closest collaboration between the manufacturers and the electricity supply authorities; a joint sub-committee of representatives of the Central Electricity Generating Board and the Area Boards, and of all the manufacturers, including non-members, met frequently and discussed technical problems which was of valuable assistance to the industry. For, example, it had prepared a Standard Specification for distribution transformers in the smaller range of sizes. Another joint committee, of representatives of the electricity supply authorities and members of the Association, which had met to discuss and agree prices, had been disbanded in 1953 by the Central Electricity Authority, much to the regret of the manufacturers.

Mr. Charley said that he had no doubt, as a result of his visits and discussions abroad, that British transformers were the best in the world. Provided that they were reasonably

competitive in price, the foreigner would always prefer them. But they had to compete with foreign exporters who were aided by government subsidies. In Italy a turnover tax was paid on all products, and an Italian manufacturer who exported a transformer obtained a refund covering all the turnover tax paid in respect of the transformer at every stage of production, including the tax paid on the materials, and the rebate obtained was considerable. Moreover, most foreign exporters had stable home markets, since in most foreign countries—Sweden, Germany, Austria—there were only one or two domestic manufacturers and, therefore, they could fix their domestic prices.

Another witness who gave evidence in support of the agreement, Mr. R. M. I. Hobill, general manager, Transformer Department, Ferranti, Ltd., said that his company was very departmentalised and each department had to compete for the company's available capital. If the Transformer Department were making a loss, it would have great difficulty in obtaining funds for development or expansion and would be forced to curtail expenditure. The expensive visits of senior technical staff to foreign countries, on which they relied for many of their export orders, would have to stop. Considerably less would be spent on research and development, and work on some projects would have to be postponed. Nor could any research work which was abandoned by manufacturers be carried out by the Electrical Research Association because that Association was financed by the subscriptions of manufacturers and had not the facilities for application research and development. Nor could such work be farmed out to individual manufacturers because they would have curtailed their own research staff and facilities. Mr. Hobill was confident that export prices today were at rock bottom level. At the last meeting of the International Electrical Association, at which manufacturers throughout the world discussed matters of common interest, everyone

had agreed that export prices were too low and that they should rise. This would probably happen in three or four years' time. The general level of Continental prices was 20 per cent below British prices, and as a result Continental manufacturers had obtained orders in Commonwealth markets despite preferential duties in favour of British goods.

If the agreement were abrogated, Mr. Hobill continued, the Central Electricity Generating Board could force prices down by exerting pressure on individual manufacturers. Any eight or nine of the Association's ten members could supply the whole of the Board's requirements. He denied that such a threat would be unrealistic or that if it should be made political pressure would force the Board to withdraw.

Mr. A. R. Kevan, of the Transformer Tendering Department of English Electric, said that the Association would introduce new price schedules next month, and it was their intention to have re-costing approximately every three years. He was questioned by counsel for the registrar about an informal meeting earlier this year at which the five largest manufacturers outside the Association were invited to join the Association, to restrict competition in the field of smaller transformers and to give the Association a substantial monopoly in larger transformer business. The offer was rejected by the independent manufacturers.

The hearing continues.

## Australian Jubilee

The British General Electric Co. Pty., Ltd., the Australian subsidiary of the General Electric Co., Ltd., has just celebrated its fiftieth anniversary. Founded in Sydney in 1910, the B.G.E. now employs 1,500 people at its factories at Rosebery and Auburn, New South Wales, and the branches spread across Australia. Mr. T. E. Morgan is chairman and managing director of the company.



**INDUSTRIAL NEWS****SCHOOL HEATING TESTS**

THE results of comparative tests on heating school buildings by electric thermal-storage block-heaters and other methods are given in Utilisation Research Report No. 16, published by the Electricity Council. The tests have been carried out in co-operation with the Ministry of Education using four pairs of schools in different parts of England. One school of each pair was heated by a hot-water radiator system and the other by block-storage heaters. Temperature and consumption records were obtained for one heating season and the comparative data were collated.

The capital cost of the block-heater installation was found comparable to that for solid fuel, and considerably lower than one burning oil. The running costs of the electrical installation proved to be 50 to 100 per cent higher than those using solid fuel, and 30 per cent lower than the oil-fired installation, and the total annual cost

of electric heating equalled that of solid fuel and was less than oil heating.

The temperatures maintained at all the schools did not differ significantly, but all systems failed in varying measure to provide the specified temperature (62°F) during a cold spell, and it is recommended that the installed block-heater capacity should be at least 25 per cent greater than the calculated heat loss. The annual consumptions for the electrically-heated schools ranged from 21,000 kWh to 31,900 kWh per therm (685 kWh to 1,090 kWh per kW) of calculated heat loss. These consumption figures could probably be reduced by improved methods of control, which would prevent overheating in mild weather. Assessments of comfort conditions in the mornings and afternoons for the whole heating season show no decisive difference between the electrically-heated and other schools.

Copies of this report may be

obtained free of charge on application to the Press and Information Officer, The Electricity Council, Trafalgar Buildings, 1, Charing Cross, London, S.W.1.

**Transformer Examination**

A report on the opening up and examination of a 100 kVA oil-immersed sealed transformer after nine years' service has just been published by C. A. Parsons & Co., Ltd. The purchasers were anxious to make an examination of one of a batch of 15 transformers to determine the internal condition after nearly ten years' service, and thereby obtain confirmation of the performance of sealed units of this type. The transformer chosen was selected at random from the batch and was returned from the Far East to Heaton Works where, on 3rd May, 1960, it was opened up and examined in the presence of a delegation of the Royal Dutch/Shell Group engineers. The examination showed that a sample of oil from the tank bottom had an electrical resistance of 7,000 MΩ and the transformer itself was in excellent condition.

**Welsh Nuclear Power Project**

A general view of the nuclear power station site at Trawsfynydd with the first reactor in course of construction in the centre. The foundations for the second reactor can be seen between the first reactor and the "Goliath" crane on the left. The hills around the Ffestiniog pumped storage project can be seen in the background



INDUSTRIAL NEWS *[continued]***SCOTTISH REINFORCEMENT SCHEMES**

TO meet the growth of load in the Saltcoats/Kilbirnie area of Ayrshire, the South of Scotland Electricity Board has authorised a scheme which provides for the installation of two 60 MVA, 132/33 kV transformers in the grid substation at Saltcoats in place of the existing 30 MVA unit, and the erection of a 33 kV overhead line between Saltcoats and Kilbirnie. The scheme is estimated to cost £176,000.

Another reinforcement project, costing £116,000, provides for a new

33/11 kV substation to be established at Kelliebank, Alloa, supplied from Devonside grid substation by two 33 kV underground cables.

In the Linlithgow area a new 33/11 kV substation, to be supplied from Grangemouth grid substation by two 33 kV overhead lines, will be constructed at Manuel, and the voltage of the network around Linlithgow will be changed from 6.6 and 22 kV to 11 kV. The cost will be approximately £111,000.

**Orders for Mine Winders**

Orders worth more than £230,000 have been received by the Heavy Plant Division of Associated Electrical Industries, Ltd., for mine winders for the National Coal Board and the Union Corporation of South Africa. The Coal Board orders are for geared a.c. winders, one of 1,750 h.p., for Woolley Colliery, Yorkshire, and the other of 1,450 h.p., for Merthyr Vale Colliery. The equipment to be supplied to the Union Corporation of South Africa is a twin-motor d.c. drive for a 4,500 h.p. winder with Ward-Leonard control.

**TELEPHONE LINK FOR NEW ZEALAND**

A microwave multi-circuit telephone system has been supplied by Standard Telephones & Cables, Ltd., to link Wellington and Auckland, in New Zealand, a distance of 262 miles. The system may be used, with certain additions, to carry television programmes at a later date. At present, the link has one two-way radio channel capable of carrying 600 simultaneous telephone calls. There is also an identical standby radio channel to which the telephone traffic is switched automatically in the event of severe fading or excessive noise on the working channel.

**Heating and Ventilating Conference**

THE Institution of Heating and Ventilating Engineers is desirous of arranging an international conference to run concurrently with the Exhibition of Heating, Ventilating and Air Conditioning Equipment to be held in September-October, 1961. A sum of £1,000 has been devoted to the expenses of the conference organisation and it is hoped to meet other costs, including the entertainment of distinguished guests, particularly those from overseas, from the registration fees. However, to guard against contingencies, the Institution has appealed to manufacturers, contractors and other interested parties to provide working capital in the form of interest-

free loans, 50 per cent of which will form a guarantee against loss.

The Institution states that over half of the loans and guarantees have been promised but it will welcome contributions from firms or individuals in the form of an interest-free loan and/or a guarantee against loss or a donation against special hospitality. Offers should be sent to the chairman of the Conference Co-ordination and Management Committee, Mr. J. R. Paterson (G. N. Haden & Sons, Ltd.), 7-12, Tavistock Square, London, W.C.1, or the Conference treasurer, Mr. J. M. Cooling (J. Jeffreys & Co., Ltd.), 195, Waterloo Road, London, S.E.1.

**Ice Stadium Lighting**

The Frogner Stadium in Oslo, Norway, accommodates 20,000 spectators. Many games in the Norwegian bandy championships are held on the rink and this winter one game in the world championship will be played there. Recently 64 Benjamin deep bowl dispersive reflectors, each housing a 1,500 W tungsten lamp, have been installed to illuminate the stadium. The reflectors are mounted about 11 metres above the ice. The fittings are finished in "Crysteel" vitreous enamel which is proof against moisture, atmospheric gasses and air impurities.



Frogner Stadium, Oslo, illuminated by 1,500 W tungsten lamps in Benjamin deep bowl reflectors

**ARCTIC POWER SCHEME**

A preliminary plan for the building of three power stations with an annual output of 2,600 million kWh on the upper reaches of the Stora Lule River, in Arctic Sweden, has been presented by the State Power Board. Including the construction of reservoirs, but not transmission lines, the scheme is estimated to cost £45 million.

**Changes at Telcon Works**

British Insulated Callender's Cables, Ltd., announces that, in conformity with the policy of concentrating the manufacture of products into specialised units, it has been decided to transfer the manufacture of plastic cable and associated products from Telcon Works, Greenwich, to other factories of the B.I.C.C. Group. Production at Greenwich will henceforth be exclusively submarine cables and marine engineering products. It is expected that these arrangements will become fully effective by 31st December, 1961.

The company states that this re-arrangement of production into more efficient units will bring about some redundancies among both staff and workpeople. Alternative employment will be offered to the maximum possible extent in other units of the group, but those who cannot be so employed will be offered financial compensation based on age and length of service.



## LONDON TRANSPORT RESEARCH

LAST Monday the new £300,000 Chiswick research laboratory for London Transport was opened by the chairman of the Executive, Mr. A. B. B. Valentine. The laboratory, which will have a total staff of 80 and will serve the L.T.E.'s various development sections, is mainly concerned with mechanical engineering, fuel and paint testing and metallurgy. The electrical sections deal with storage batteries, filament lamps and noise detection. Heavy current work is carried out at the Wood Lane testing station of the L.T.E. The laboratory has, however, a number of instruments and recorders for carrying out heavy current work outdoors on any part of the underground system.

The laboratory possesses a 50 kV 50 c/s insulation testing equipment and a 260 kV X-ray unit, while the major item in the mechanical section



London Transport's new research laboratory

is a fatigue testing machine for 6½ in diameter 5ft long steel axles. The electrical section is at present developing a crack depth measuring apparatus. It is based on the comparison of the voltage drop across the crack and that over an uncracked portion of the same metal surface. In the past, the electrical section has enabled the L.T.E. to save £50,000 per annum by development work which has led to the doubling of the life of bus batteries.

by Philips Electrical, Ltd., which contains forty-eight 40 W cool-white fluorescent lamps and fourteen 80 W green fluorescent lamps. In addition, there are seventeen 100 W spotlights for special-purpose lighting. On the promenade floor, at street level, the lighting is by fourteen 150 W spotlight units, four of which are of high intensity so that particular exhibits can be highlighted.

The lighting arrangements on the upper sales floor take the form of an illuminated suspended ceiling 30ft by 20ft with ninety-four 80 W cool-white fluorescent lamps.

Ceiling fittings in the demonstration room serve a twofold purpose. Two battens carry ordinary tungsten lamps on the flat section and infra-red lamps on the sloping section, the infra-red lamps providing heat as well as additional lighting (except at the entrance, where the carpet is fitted with a heated underlay). In the conference room, convector heaters are installed and lighting is by modern ceiling and wall fittings.

On the flat roof at the rear of the premises a 10ft by 8ft greenhouse has been constructed where soil warming, propagating, ventilation, irradiation and thermostatically controlled heating will be demonstrated.

## Lincoln's New Service Centre

ON 25th November the Mayor of Lincoln (Councillor E. J. Richardson) officially opened the East Midlands Electricity Board's new Service Centre in High Street, which replaces the Silver Street premises taken over from the Corporation on nationalisation. Speaking to an audience of about 70 in the demonstration theatre, Mr. N. F. Marsh, the chairman of the Board, referred to the difficulties which had been experienced before and since the war, both by the Corporation and his former company, the Mid-Lincolnshire Electric Supply Co., in their

search for adequate showrooms, and said he believed that the new Service Centre would add to the amenities of the shopping area of the city.

While the dignified façade of the High Street building has been retained, the interior has been extensively reconstructed. Three separate sales floors have been provided in place of the existing ground floor and basement, and a floor warming system with a total loading of 35 kW has been installed. In the staff accommodation and offices there are block storage and wall-mounted infra-red heaters.

The lighting of the lower sales-floor is in the form of a central raft, designed



The new Service Centre at 191, High Street, Lincoln, and (below) the demonstration room



### FALL IN REFRIGERATOR DEMAND

The home demand for British-made domestic refrigerators fell again during October, according to figures issued by the Domestic Refrigeration Development Committee. Manufacturers' deliveries to the home market, totalling 32,057, were 43 per cent lower than in October last year, when they totalled 56,468. Deliveries of domestic refrigerators to the export market, 7,974, were, however, 23 per cent more than in October last year. The total for the first ten months of the year is 115,078, 40 per cent more than in the same period of 1959.



INDUSTRIAL NEWS *[continued]*

## Edmundsons New Ealing Premises

**A**FTER nearly three years in temporary premises, the Ealing branch of Edmundsons Electrical Wholesalers, Ltd., has now moved into new permanent premises at Craven Road, Ealing, London, W.5 (telephone: Ealing 6048).

The building is immediately behind the site of the company's original branch, which was first established as a West London depot in 1934, and adjacent to the vacated temporary premises. It occupies a ground floor area of approximately 6,000 sq ft and its features include a combined trade counter and display room, offices, and a large stores area. The extra-high ceiling enables conduit to be stacked upright, thus enabling large stocks to be carried. Much use is made of "Erecto" slotted angle for shelving and storage bays and fluorescent lighting is installed throughout.

The branch operates a daily van delivery service to the West London postal area and adjacent Home Counties. Orders can be accepted at

*Front view of the new Ealing branch premises showing the spacious goods inward and outward bays. The trade counter entrance is on the left*



any time during the day and night as the "Ansafone" telephone recording system has been installed. Mr. E.

Beckingsale is the area manager, and the branch manager is Mr. F. W. Harris.

## GARCKE'S MANUAL

THE 1959-60 edition of "Garcke's Manual of Electricity Supply" has recently been published by the Electrical Press, Ltd., 19-20, Noel Street, London, W.1, price £4 4s. The general survey contains the constitution and functions of the Electricity Council, with a statistical review of electricity supply progress, based on

the various authorities' annual reports, and a section dealing with nuclear power development. This is followed by a section dealing with the Central Electricity Generating Board. Information is provided on the various Area Electricity Boards in England and Wales and the authorities in Scotland, Ireland, the Isle of Man and the Channel Isles.

There is a directory of personnel, giving the principal senior officers of the Electricity Boards and directors of electrical and allied manufacturing companies, and the Manual includes particulars of the manufacturers of electrical and allied plant, and associations and institutions.

## Tubular Quartz Lamps

TUBULAR quartz infra-red lamps for use in the catering trade for heating and lighting food on display to the public are now available from the



*In this "coin in the slot" canteen meal dispenser made by Venders & Renters, Ltd., 1,000 W thermostatically controlled Mazda "dimpled" infra-red quartz tubes are used in a vertical position*

A.E.I. Lamp & Lighting Co., Ltd., Melton Road, Leicester. As these lamps are claimed to be practically impervious to thermal shock, they are suitable for use in food warming and cooking equipment where splattering grease or moisture might break other types of infra-red lamps. The lamps provide radiation which cooks evenly right through the food with a deep heat. They can also be used in office copying machines.

The Mazda tubular quartz lamp consists of a single-coil tungsten filament held in a gas-filled quartz tube and supported at intervals by tantalum discs. No control gear is required. A variety of wattages and voltages with special caps to suit the application are available. The 1,000 W, 240 V tube is listed at 84s.

## Trade Marks Fees to be Raised

The Board of Trade announces that, as from 1st May, 1961, higher fees will be charged for applications for trade marks and registrations, and also in respect of renewals. Copies of the Draft Rules may be obtained from H.M. Stationery Office, price 3d (by post 5d).

## SHORT-TERM INSTALLATIONS

The North Eastern Electricity Board is to install electricity in 200 houses about 70 years' old in the Askew Road area of Gateshead. The houses are likely to be demolished in two or three years' time, and in view of their short life the Board devised a means of supplying energy at a cost of only £13 a house. This is to be repaid by the tenants at 2s 6d a week.

## Aratiatia Power Station

Boving & Co. (ANZ) Pty., Ltd., the Australian subsidiary of Boving & Co., Ltd., England, have secured a contract for three 42,000 h.p. vertical Francis turbines for installation in the New Zealand Electricity Department's Aratiatia power station. This power station is being built on the Waikato River between Rotorua and Wairaki, in the North Island. Delivery will be made during 1962 and 1963.



## Computer Centre at Woolwich Polytechnic

A "STANTEC ZEBRA" automatic electronic digital computer at the Woolwich Polytechnic was formally put into service last week by Sir Thomas Spencer, M.I.E.E., chairman of Standard Telephones & Cables, Ltd., and governor of the Polytechnic. The computer was designed by Dr. W. L. van der Poel, of the Netherlands Post Office Research Laboratories, and developed and manufactured by Standard Telephones & Cables. It is suitable for mathematical, scientific, engineering and statistical calculations and for commercial, financial and industrial applications. A large library of problems already programmed is available to users.

The Computer Centre established in the Mathematics Department of the Polytechnic will be used as a service to users in industry and commerce who

are invited to discuss their problems with the computer staff and use time on the computer; for the training of students; and as an aid to research by members of the staff and post-graduate students of the Polytechnic and other educational establishments.

### Electric Resistance Furnaces

British Furnaces, Ltd., in association with Kepston, Ltd., have formed a Kepston Division of British Furnaces at Drewry for the production of electric resistance furnaces, to operate with controlled atmospheres including hydrogen, nitrogen, argon, and helium for heat treatment and brazing operations of most metals and stainless steels. The features of these furnaces include controlled heating rates up to 100°C/min, to 1,600°C, and controlled cooling from vacuum slow to 100°C/min down to 450°C.

### CHRISTMAS SHOPPING DECORATIONS

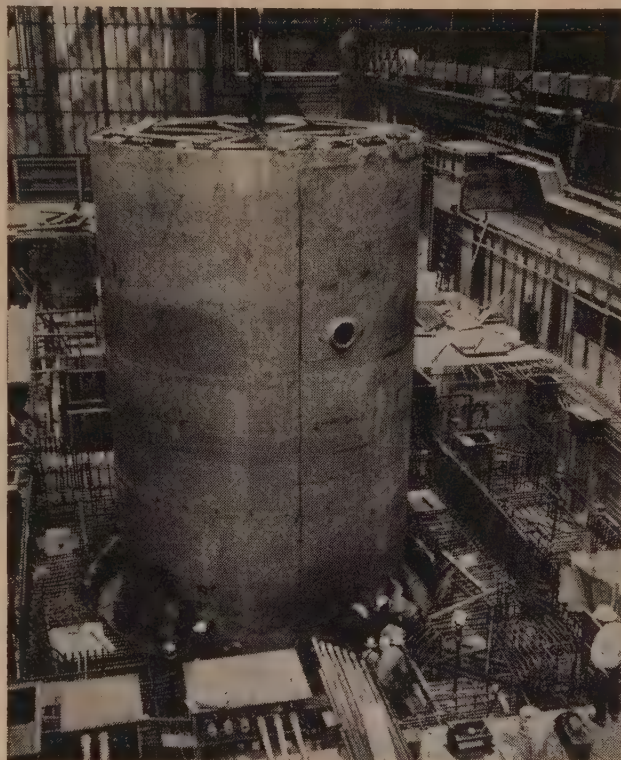


Coloured decorations, simulating snowflake patterns as seen under a microscope, in Oxford Street, London, where the Christmas illuminations were recently switched on

### House Heating Experiment

New houses to be built by Fife County Council during an experimental period are to be heated by electricity or gas; no provision will be made for solid-fuel heating. Initially, 50 per cent of new houses will be provided with underfloor electrical heating and 50 per cent with warm-air gas heating.

## Sodium-Cooled Reactor



The 65 ton reactor vessel being lowered into place at the 75 MW Hallam nuclear power plant near Hallam, Nebraska. This 19ft diameter 33ft high vessel will contain the core of a sodium-cooled, graphite-moderated reactor designed by Atomics International, a division of North American Aviation, Inc. It is scheduled for completion in 1962 and will be operated by a private utility

## Portuguese Pulp Mill

AMONG contracts recently obtained by Associated Electrical Industries, Ltd., for the paper industry is one valued at approximately £100,000 for electrical equipment required for a second pulp mill which the Caima Pulp Co. at Oporto is constructing at Constanca, in the south of Portugal. A.E.I. is supplying power house equipment, switchgear and control gear, as well as nearly all the electric motors required. The new mill is scheduled to start production in the spring of 1961. Initially, it will produce 20,000 tons of sulphite eucalyptus pulp per annum, and there are plans for a later extension which will more than double this capacity. The mill is being planned and co-ordinated by Boving & Co., Ltd., London, who are also supplying the pulp process machinery.

The boiler plant is being supplied by Babcock & Wilcox, Ltd., and will be associated with A.E.I. generating plant and power distribution equipment.

### Water Power in Ulster

A hydro-electric generating station in the Mourne Mountains is a feasible proposition, according to the result of investigations recently carried out in the district. Announcing this in the Ulster Commons recently, Lord Glentoran, Minister of Commerce, added that until he had completed an examination of different possible schemes it would be unwise to assume that hydro-electric plant would form part of the next programme of development.



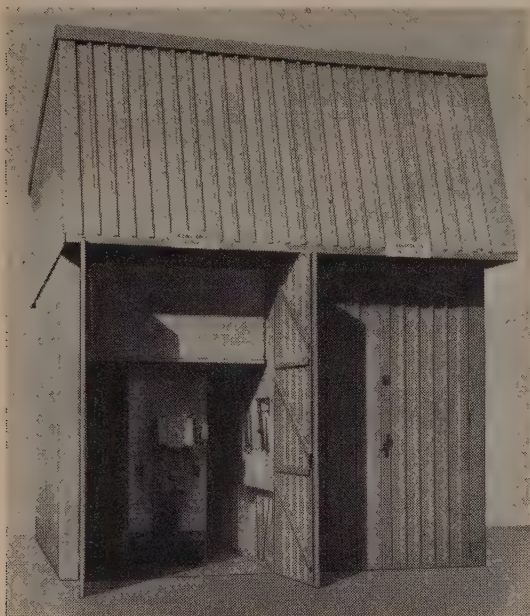
INDUSTRIAL NEWS *[continued]*

## Packaged Switching Station

AN outdoor "packaged" 33 kV switching station called the "Weather-beater" is being produced by the English Electric Co., Ltd., English Electric House, Strand, London, W.C.2. Associated civil engineering costs are low as the unit needs only a simple concrete raft foundation; no building is necessary. The exterior weatherproof housing is of aluminium, which needs no painting or periodic

maintenance. A switching station is built from standard units, each 16ft 9in high by 12ft 3in deep. A 1,200 A unit is 6ft 6in wide and a 1,600/2,000 A version 7ft 3in wide.

Each unit houses either an OKM4 or OKM5 single-tank oil circuit-breaker for current ratings up to 1,200 A and 2,000 A respectively. It is available in single busbar form for short-circuit ratings of 750 and 1,000 MVA. Isolation is by hand operated isolators on both sides of the circuit-breaker. Built-in cable and, where required, busbar earthing equipment is included, as well as hand operated safety shutters. All the usual interlocks associated with metalclad gear are provided. The isolators, earthing equipment and shutters are all operated from a single control point mounted on the side of each unit. Mechanical interlocking ensures that the correct sequence is always followed.



English Electric packaged switching station

## DOMESTIC APPLIANCE DEMAND PROSPECTS

IN addition to the usual review of the economic situation, the November issue of the *Economic Review* (published by the National Institute of Economic and Social Research) contains an article by Mr. L. Needleman, of the National Institute, on the demand for domestic appliances. This looks at the demand prospects, up to 1970, for television receivers, washing machines, refrigerators and vacuum cleaners. Taking all four appliances together, the article concludes that the demand rose rather more than 15 per cent a year on average in the 1950's.

An analysis, based on certain assumptions about the appliances' length of life and about saturation levels, suggests that in the 1960's demand is not likely to rise faster than  $2\frac{1}{2}$  to 5 per cent a year. It appears, from capacity figures, that manufacturers have, generally, been too optimistic about the future trend of demand (though in some instances the

introduction of very much cheaper appliances could alter the picture). Analysis of past short-term fluctuations suggests that a reduction in prices of 10 per cent could lead to a 10-20 per cent once-for-all rise in demand, but the removal of the present hire-purchase restrictions would have only a mild effect.



Exterior of the new Nottingham branch of the Stearn Electric Co., Ltd.

## ELECTRIC FLOOR WARMING

Two new publications on floor warming have just been issued by the Electrical Development Association. One, mainly for the use of architects, is an 18-page illustrated booklet entitled "Notes on the Construction and Finish of Floors that are to be Electrically Warmed," and the other, an eight-page illustrated folder, "Electric Floor Warming, Questions and Answers," is mainly intended for the use of salesmen.

Copies of the booklet (EDA 1927) and of the folder (EDA 1934) can be obtained from Electricity Service Centres or direct from the Association at 2, Savoy Hill, London, W.C.2.

## Wholesalers' Expansion

Expansion at three of the branches of the Stearn Electric Co., Ltd., electrical distributors and manufacturers, is announced by the company. At Nottingham new premises have been erected in Daleside Road, a short distance from the city centre. Drive-in car parking facilities and separate bays for loading and unloading goods are important amenities of the building. A two-storey block forms the front of the premises, containing a reception office, showroom, administrative offices and staff rest room. The one-level warehouse at the rear of the office block simplifies the handling of stock and improves trade counter service.

The Preston branch has moved to Magnet House, in Derby Street, previously occupied by the G.E.C. These premises offer excellent parking facilities, twin loading bays and a well-situated trade counter. Goods are stored on two floors, movement of stock between the floors being by means of an electric conveyor. A showroom is situated on the first floor and the rear part of the building covers four floors and a basement. The total area of the premises is 22,000 sq ft.

To give the Lincoln branch the extra space it needs, two properties, adjacent to the existing premises, have been acquired in Monks Road.



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Norman Abbott  
Technical Sales Director  
or  
M. G. Matthews  
Sales Manager



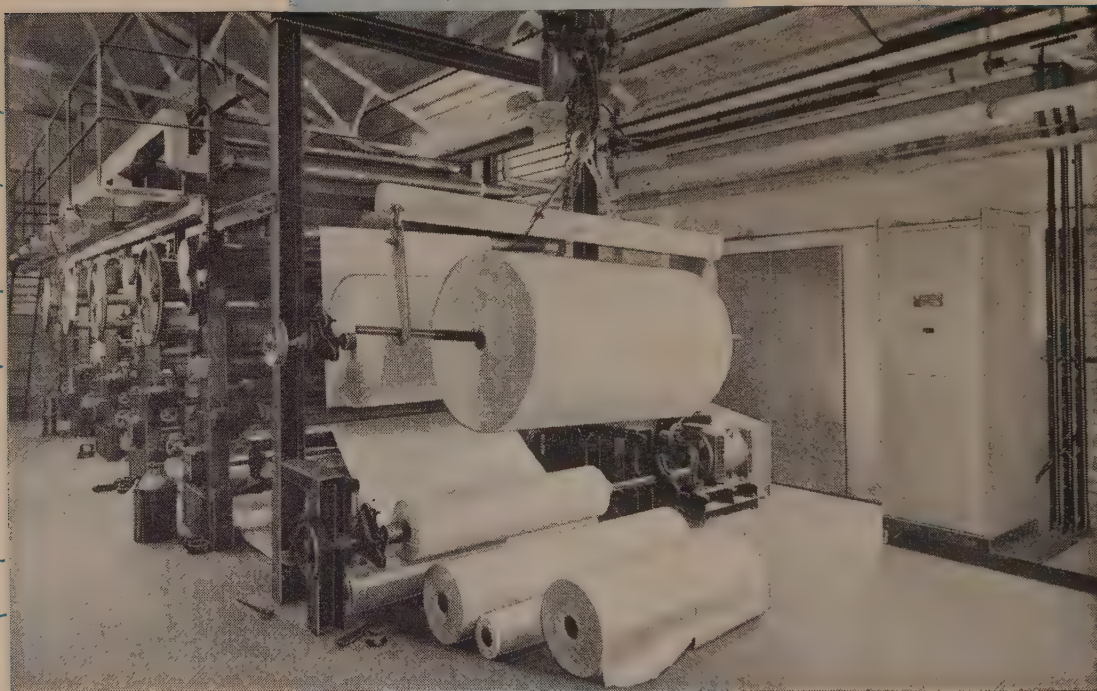
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## M.T.E. EXPANSION

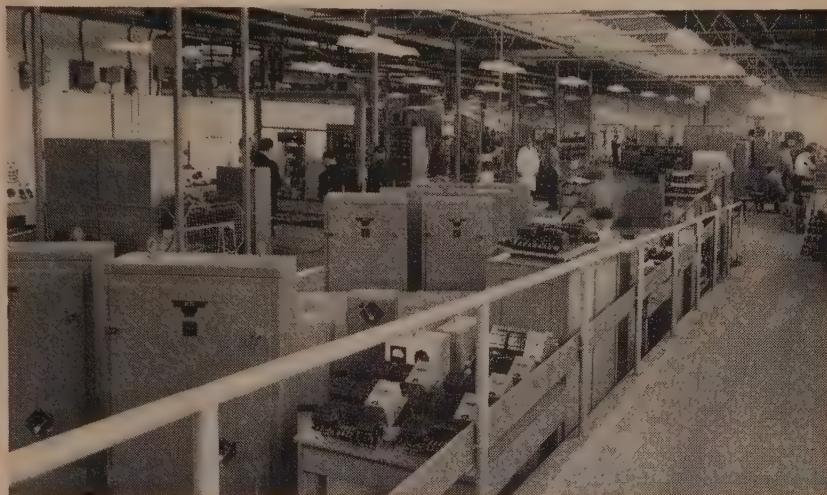
THE chairman of M.T.E. Control Gear, Ltd., Mr. R. Browne, formally declared open an extension of the company's factory at Leigh-on-Sea, Essex, which increases by one-third the productive floor space and office accommodation.

Since its formation, in small premises at Whittlesea, Cambridgeshire, in 1946, M.T.E. has steadily become established in the field of control gear manufacture, supplying "custom built" control panels for a wide variety of industrial applications. In 1956 an entirely new range of contactors, overload relays, timing relays, isolators and interlocking terminal blocks was introduced. A dual service thus became available—complete engineered multi-motor control panels or the components to enable the customer to build his own control panels and starters. Concurrently, M.T.E. were developing the "Disc-mag" range of electromagnetic a.c.

disc type brakes for electric motors. The company has now introduced a uniselector system. Designed for programming and sequencing applica-

tions, the unit incorporates a heavy duty uniselector with plug-in arrangements on all contacts and a patented load switching circuit which permits direct switching of solenoids and contactors without the use of slave relays. Change of programme or complete replacement of this unit can be achieved very quickly.

Panel assembly lines and test bay in the new M.T.E. extension



### PARKINSON COWAN DIVISIONS MERGE

Mr. H. P. Barker, chairman of Parkinson Cowan, Ltd., announced last week that, for the purpose of "pursuing more efficiently the rapid growth of business now in prospect" and to "allow marketing efforts to be further concentrated," it had been decided to unify two of the company's operating divisions—Parkinson Cowan Instruments and Measurement, Ltd. The new division is known as Parkinson Cowan Measurement and will be headed by Mr. C. H. Chambers, previously divisional manager of Parkinson Cowan Instruments. Products of the new division include metering and automatic control equipment, a range of specialised hydraulic pumps and remote control and tele-metering equipment.

### Athens Company Taken Over

The British-owned Athens-Piraeus Electricity Co. has now been acquired by the Greek Public Power Corporation for a total sum of over £11 million. The undertaking includes 200 MW of power plant and is responsible for the supply of about half the electricity consumed in Greece. The company was granted its concession in 1925 for a period of sixty years although the Greek Government had an interim purchase option.

### Pye to Make Research and Training Reactors

A licensing agreement for the manufacture and sale in the United Kingdom and Eire of nuclear research and training reactors has been concluded between the American Machine & Foundry Company, U.S.A., and Pye, Ltd. This is jointly announced by Mr. Morehead Patterson, chairman of A.M.F., and Mr. C. O. Stanley, chairman of Pye, Ltd.

Under the terms of the contract Pye

will make available to U.K. universities, hospitals and research centres a fully developed and widely used series of low-power reactors and related equipment as well as design and engineering services. The agreement also anticipates the extension of A.M.F.-Pye co-operation in the nuclear field throughout the British Commonwealth as well as Iraq, Jordan and Egypt.

### Consumers and Sales

Details of electricity sales to the various classes of consumers during the quarter ended 30th September last, issued by the Electricity Council, show that farm consumption rose by 18.1 per cent compared with 11.3 per cent in the second quarter of the year. Of the two main classes of consumers,

domestic users continued to set the pace with a rise of 16 per cent compared with an increase of 12.1 per cent in industrial supplies.

The sales figures given in the accompanying table relate to kWh metered or billed during the period concerned.

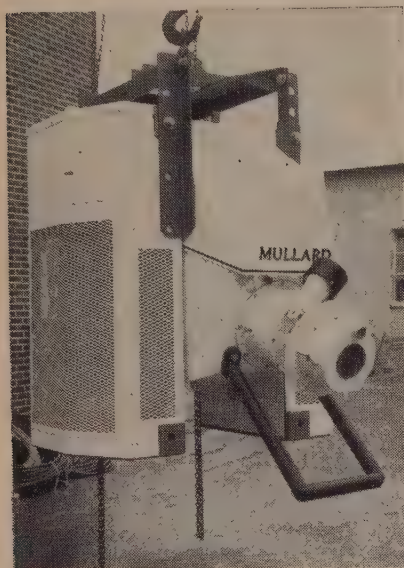
|                                         | Three months<br>ended 30th<br>September, 1960<br>Million kWh | Increase<br>over correspond-<br>ing period of 1959<br>% | Twelve months<br>ended 30th<br>September, 1960<br>Million kWh | Increase<br>over previous<br>twelve months<br>% |
|-----------------------------------------|--------------------------------------------------------------|---------------------------------------------------------|---------------------------------------------------------------|-------------------------------------------------|
| Domestic ... ..                         | 5,807.3                                                      | + 16.0                                                  | 28,773.6                                                      | + 12.5                                          |
| Farm ... ..                             | 348.4                                                        | + 18.1                                                  | 1,612.7                                                       | + 5.6                                           |
| Commercial ... ..                       | 2,111.4                                                      | + 15.9                                                  | 11,186.6                                                      | + 11.0                                          |
| Combined Domestic/<br>Commercial ... .. | 304.5                                                        | + 12.8                                                  | 1,466.6                                                       | + 10.9                                          |
| Industrial ... ..                       | 10,628.4                                                     | + 12.1                                                  | 45,330.7                                                      | + 13.0                                          |
| Public Lighting ... ..                  | 161.3                                                        | + 8.8                                                   | 751.4                                                         | + 8.1                                           |
| Traction ... ..                         | 385.4                                                        | + 2.7                                                   | 1,565.8                                                       | + 13.1                                          |
| <b>TOTAL ... ..</b>                     | <b>19,746.7</b>                                              | <b>+ 13.5</b>                                           | <b>90,687.4</b>                                               | <b>+ 12.2</b>                                   |



## INDUSTRIAL NEWS /continued

## Mobile Linear Accelerator

THE U.K. Atomic Energy Authority has taken delivery of a 4.3 MeV linear accelerator designed to make X-ray examinations of pressure vessels in nuclear power stations during construction. The machine is believed to be the first completely mobile linear



Mullard 4.3 MeV linear accelerator

accelerator in the world. It will permit the welds in the 4in thick steel spheres of the pressure vessels containing the reactor cores to be radiographed on site with the minimum of disturbance.

It will be used for the first time at the 500 MW Trawsfynydd station now under construction in Merionethshire for the C.E.G.B. by Atomic Power Constructors, Ltd. The accelerator is a compact, self-contained unit weighing 2 tons. It has been designed by Mullard Research Laboratories and developed under a contract placed by the Authority with Mullard Equipment, Ltd.

### Generators for Petrol Stations

A total of 103 generator units for outlying B.P. petrol stations in Turkey is one of the latest export orders received by A. C. Morrison (Engineers), Ltd. These 6 kW sets are self-contained and comprise a Ruston air-cooled diesel engine flexibly coupled to a Lyons 6 kW, 380/220 V, three-phase, four-wire, 50 c/s self-regulating alternator designed to maintain the output voltage within close limits at power factors between 0.8 and unity.

## TRADE ANNOUNCEMENTS

**Delapena & Son, Ltd.**, have been appointed sole agents for Great Britain and certain other countries for the range of induction heating handling equipment manufactured by Fritz Düsseldorf, Freiburg, West Germany. The equipment available includes special-purpose and multi-purpose fixtures for heating parts under all production conditions.

Balzars Aktiengesellschaft für Hochvacuumtechnik, for whose products Delapena & Son were agents, have now set up their own United Kingdom organisation as **Balzars High Vacuum, Ltd.**, with an office at 1, Mornington Terrace, London, N.W.1, formerly Delapena's London office.

A new depot has been opened at Crawley by the **General Electric Co., Ltd.**, to replace the old premises at Brighton. The manager is Mr. George Knight, who was formerly deputy manager at Brighton.

The London Area order office of **Atlas Lighting, Ltd.**, is now at Angel Works, Angel Road, Edmonton, N.18 (telephone: Edmonton 3050).

The **Elkay Electrical Manufacturing Co., Ltd.**, have appointed the following agents:—Scotland: Mr. A. Roy Duff, 73, Robertson Street, Glasgow, C.2. Midlands: Mr. L. W. York, 179, Wood Lane, Earlswood, Solihull, Warwicks.

**Cozens & Sutcliffe (Holdings), Ltd.**, have purchased the business of R.J.S. Services, Ltd., electrical and radio wholesalers, Stoke-on-Trent. Mr. H. V. Cozens is chairman of the new

board, Mr. H. A. Knight managing director and Mr. G. S. Heymer, previously domestic sales manager, has been appointed director and general manager. The company will continue to trade under the name of R.J.S. Services, Ltd. The other member company of the electrical division of the group is A. S. Duran & Co., Ltd.

### BIRMINGHAM ELECTRICAL ENGINEERS' NEW PREMISES

New offices and works for Harold F. Ward, Ltd., electrical engineers and contractors, Birmingham, were recently officially opened by the chairman of the Midlands Electricity Board, Mr. W. S. Lewis, C.B.E. After a tour of the premises in company with about 60 people, lunch was taken at the Regency Club. In his speech, Mr. Lewis recalled the early days of his apprenticeship with Walker Brothers of Birmingham, and said that Mr. H. F. Ward was also a former apprentice of that firm. Both Mr. Lewis and Mr. Ward mentioned the excellent relationship which existed between the electrical contractors and the Board.

### Shop Steward's Assurance

The executive committee of the Amalgamated Engineering Union last week interviewed a member, Mr. George Wake, who was asked to "explain" his activities as secretary of the unofficial Shop Stewards' Committee which was responsible for calling a 24-hour strike in the electricity supply industry last year. Mr. Wake said he believed that he was acting in the best interests of the Union and its members in supporting their wage claim by unofficial means. He gave an assurance, however, that he would in future abide by the Union's rules and not participate in such activities.

### Instrument Makers' 150th Anniversary

To celebrate their 150th anniversary C. F. Casella & Co., Ltd., have published a brochure briefly reviewing the company's history. It also includes a section illustrating selected instruments to indicate the present range of equipment and a list of current literature available, free of charge, on application to the company at Regent House, Fitzroy Square, London, W.1.

### CALENDARS AND DIARIES

Bound in navy-blue leather, the neat pocket diary received from A. Reyrolle & Co., Ltd., contains a full list of the company's area and district offices, overseas branches, agents and distributors.

The calendar of the Westinghouse Electric International Co. has large sheets, each covering three months.

A coloured view of Kyle Akin and Skye surmounts the calendar of Mavor & Coulson, Ltd., which has large monthly sheets.

The slim diary, in soft navy-blue leather, sent by Tube Investments, Ltd., has a section of useful information including the telephone numbers of air lines, London railway stations, hotels and restaurants.



# PERSONAL AND SOCIAL

## News of Men and Women of the Industry

**Sir Gordon Radley, K.C.B., C.B.E., Ph.D., M.I.E.E.**, has been elected a director of the English Electric Co., Ltd. Last July Sir Gordon, who had recently retired from the position of Director General of the G.P.O., joined the boards of Marconi's Wireless Telegraph Co., Ltd., Marconi Instruments, Ltd., the English Electric Valve Co., Ltd., and the Marconi International Marine Communication Co., Ltd., with whom he is concerned with the development of telecommunication equipment for world markets.

British Insulated Callender's Cables, Ltd., have appointed **Mr. W. E. Hind** as manager (home sales). His responsibilities cover all aspects of the selling activities of the company at home and include matters of publicity, public relations, exhibitions and display, and market research. Mr. Hind



Mr. W. E. Hind

was formerly deputy manager (home sales). He joined the former Callender Co. in 1920 after service in the Forces from 1915 to 1919.

**Mr. G. W. Goodman**, who was for ten years on the editorial staff of the *Star*, has been appointed press officer in the Public Relations Department of the B.I.C.C. Group.

**Mr. D. Craggs** has been appointed production manager at the Ekco radio factory at Kenway, Southend-on-Sea, in succession to **Mr. J. D. Brown**, who is taking up an appointment with A.E.I. Mr. Craggs, who has been with E. K. Cole, Ltd., since 1937, was previously assistant production manager at the Ekco television assembly factory at Southend.

**Mr. C. E. Walker**, who has been appointed sales manager of Philco (Great Britain), Ltd., joined Sterling Telephone Electric Co. in 1923 and later became sales representative for Marconiphone, covering many territories but mainly East London and Essex. He transferred to "His Master's Voice" in 1945 and was promoted to southern area manager in

1954. Following the Thorn-E.M.I. link-up, Mr. Walker was appointed assistant sales manager in 1958.

**Mr. J. A. Mason**, formerly director (production) of the Automatic Telephone & Electric Co., Ltd., has been appointed deputy managing director as from 1st January next, and **Mr. F. O. Morrell**, formerly director (engineering), has been appointed director (production).

**Mr. S. Fairclough, A.M.I.E.E.**, senior assistant commercial engineer (industrial), No. 1 Sub-Area, Merseyside and North Wales Electricity Board, has been appointed commercial officer, No. 3 Sub-Area, based at Chester. He succeeds Mr. R. M. Gravett, who was recently appointed assistant chief commercial officer (industrial development). Mr. Fairclough was trained at the Liverpool College of Technology and the Liverpool Corporation Electricity Department. During the war he served overseas with the Royal Engineers, attaining the rank of captain. On his return to the supply industry in 1946 he held positions at Liverpool and St. Helens, and later became district commercial engineer at Southport.

**Mr. J. B. Spence** has been appointed to the board of Lancashire Dynamo & Crypto (Metal Industries Group) and will be general manager of the company's works at Willesden. Mr. Spence, who was previously acting general manager at Willesden, succeeds the late Mr. C. F. Jackson.

**Mr. Paul S. Delapena** has been appointed to the board of Delapena & Son, Ltd., as sales director. He is to be responsible for the sales of both the Induction Heating and Honing Divisions.

More than 200 customers and friends of **Arrow Electric Switches, Ltd.**, were entertained on 30th November at a cocktail party held at the Rembrandt Hotel, S.W.7. The guests were received by Mr. T. S. Crabtree, managing director, and Mr. B. C. Skinner, sales director. Mem-

bers of the executive staff and representatives were present. A similar function, for the Midlands, was held earlier in November at the Queen's Hotel, Birmingham.

**Mr. L. A. Sawtell**, manager of the Valve Division of Mullard, Ltd., is retiring at the end of this month. Mr. Sawtell has spent over 38 years in the radio industry and over 30 of these with Mullard. He is a past-chairman of the Radio Industries Club.



Mr. L. A. Sawtell

Gold badges, the highest awards for long and distinguished service by members of the top management of the member companies of the International Electrolux Organisation, were presented to Mr. Maurice Aitken, secretary, and Mr. George L. Hughes, technical manager, of **Electrolux, Ltd.**, at the company's annual sales dinner and dance at Grosvenor House, London, on 23rd November, by the chairman, Sir Harold Wernher.

**Mr. A. J. Spicer** is to be head of the new Export Publicity Department set up by E.M.I. Electronics, Ltd.

Three new directors have been appointed to the board of Westool, Ltd. They are **Mr. D. Riddell**, chief engineer, **Mr. D. L. Shand**, works manager, and **Mr. A. G. Why**, secretary and accountant. Mr. Riddell joined the company as research engineer in 1946 and was appointed to his present position in 1954. Mr. Shand was appointed works manager in 1958 and Mr. Why joined the company in January last year. **Mr. G. R. Hook** has resigned from the board after 41

Mr. D. Riddell



Mr. D. L. Shand



Mr. A. G. Why





years with the company, during which he was for many years managing director. He was responsible during the war for an extensive programme of development and manufacture for the Admiralty and Ministry of Supply.

**Mr. T. E. Greenfield** has been appointed sales development manager of the Industrial Process Control Division of Gresham Automation, Ltd. Mr. Greenfield, who is 43, has been connected with electronic research and development since the war and has devised instrumentation



Mr. T. E. Greenfield

methods applicable to industrial processes, as well as a number of research projects. He was previously with J. Langham Thompson, Ltd., the General Electric Co., Ltd., and English Electric Aviation, Ltd.

**Mr. E. W. Embleton** has been appointed by Mullard, Ltd., as manager of their industrial sales force which serves the commercial divisions of the company dealing with magnetic components, semiconductor devices and industrial valves and tubes.

**Mr. A. Warren**, since 1955 assistant purchasing officer with Gent & Co., Ltd., has been appointed head of the purchasing department and stores.

**Mr. D. J. Philpot** has been appointed general manager of H. E. Kettle, Ltd., electrical wholesalers, of Maidstone and Bromley. Mr. Philpot was previously field sales manager with Morphy-Richards, Ltd.

**Mr. S. M. Lejeune**, A.M.I.E.E., engineer of the Enfield District, Eastern Electricity Board, has been appointed engineering senior assistant, planning and development, Chilterns Sub-Area.



Mr. S. M. Lejeune

Mr. Keith Beken, the well-known marine photographer, was the guest speaker at the November luncheon of the **Batti-Wallahs' Society** on Wednesday last week. An above average number of members and guests for this last luncheon of the year spent a pleasant half-hour listening to his delightful and fascinating talk in which he graphically described his experi-

ences and adventures when photographing afloat. During his talk, two coloured films, excellent examples of his work, were shown, in which all the thrills of yacht racing and sailing were recaptured.

**Mr. J. S. A. Bunting**, president of the Society, was in the chair and Mr. J. G. Freeborn, past-president, proposed the vote of thanks to Mr. Beken.

The next luncheon will be on Thursday, 26th January, when the guest speaker will be Mr. George Walker, secretary, Associated Electrical Industries, Ltd. The date for the annual ladies' night has been fixed for 17th March.

**Dr. W. E. Rowlands** has joined Walmore Electronics, Ltd., as sales manager. He was previously assistant sales manager of the M.O. Valve Co., Ltd.

**Mr. F. V. Wickham**, A.M.I.C.E., has joined the board of Temple Tubes, Ltd., manufacturers of pitch fibre pipes and conduit.

**Mr. H. A. Coates**, chief accountant of Measuring Instruments (Pullin), Ltd., has joined the board of the company.



Mr. H. A. Coates

The twenty-first choral and orchestral concert by the **Lessa Music Society** (London Electricity Sports and Social Association) held on 29th November at the Royal Academy of Music, Marylebone Road, London, N.W.1, was well attended. The programme was decided by a recent popular choice competition which resulted in items to suit all tastes. The principal work was Dvorak's Symphony No. 5 in E Minor, which was admirably played by the orchestra. Leslie Atkins was the competent conductor. The choir was heard to advantage in part songs and the chorusmaster was Temple Bevan. Arthur Whitehead was the accomplished pianoforte soloist in Gershwin's ever popular "Rhapsody in Blue."

During the evening an album of records was presented to the orchestra leader, Albert Pooley, in recognition of his service to the orchestra since its inception over ten years ago. The presentation was made by the chairman of the Society, Mr. S. M. Gore.

**Mr. Barry Rogel**, B.Sc. (Eng.), A.M.I.E.E., has left Wayne Kerr Laboratories, Ltd., to take up an

appointment as managing director of the newly formed subsidiary of the Rosemount Engineering Company, Minneapolis, U.S.A. He will continue to act as consultant to Wayne Kerr.

The South Wales Electricity Board has appointed **Mr. E. Broughton**, A.M.I.E.E., as manager (designate) of the West Wales Area. Mr. Broughton, who is 52, has been manager of the Board's Rhondda District since 1958. He entered the industry in 1925 as a trainee with the Rochdale Electricity Department and later served with the Southport undertaking; Altrincham Electric Supply, Ltd.; the North Western Electricity Board, as district engineer, South West District; and the South Eastern Electricity Board, as construction, operation and maintenance engineer for the Mid-Sussex Area from 1954 to 1958. Mr. Broughton is to succeed **Mr. W. E. Richardson**, the present manager of the West Wales Area, who takes over the management of the Monmouthshire and Mid-Wales Area next March.



Mr. E. Broughton

Following the retirement of Mr. J. J. Gracie on 31st December, **Mr. T. H. Kelsey**, M.A., M.I.E.E., will become general manager of the General Electric Co.'s Engineering Works at Witton and **Mr. W. D. Morton**, M.A., A.M.I.E.E., A.M.I.Mech.E., assistant general manager, both appointments taking effect on 1st January.

Mr. Kelsey, who was born at Gainsborough in 1905 and educated at Uppingham and Downing College, Cambridge, joined the G.E.C. at Witton in 1929. During the war he was appointed Deputy Director in charge of the Directorate of Industrial Electrical Equipment at the Ministry of Supply and later became Director of Disposals. In 1947 Mr. Kelsey returned to the G.E.C. as their representative at B.E.A.M.A. He was

Mr. T. H. Kelsey

Mr. W. D. Morton





appointed technical assistant to Sir Harry Railing in 1945 and, on Sir Harry Railing's retirement, personal assistant to Mr. A. L. G. Lindley. In 1958 he became assistant general manager at Witton and in June, 1960, deputy general manager.

Mr. Morton, who was born at Killamarsh, near Sheffield, in 1924, was educated at Doncaster Grammar School and St. John's College, Cambridge. He joined the G.E.C. in 1958 as manager of the Traction Division.

**Mr. B. St. M. F. Webb-Ware**, M.A., A.M.I.E.E., has been appointed assistant chief transmission project engineer to the Transmission Project Group of the Central Electricity Generating Board. Mr. Webb-Ware, who was educated at Rugby and Trinity College, Cambridge, received his training with A. Reyrolle & Co., Ltd. He joined the South East England office of the Central Electricity Board as a technical assistant in 1934 and in 1938 he moved to headquarters as an assistant engineer in the System Operations Department, a position he held until 1941, when he became assistant construction and contracts engineer. Since 1948 Mr. Webb-Ware has been co-ordinating engineer (specifications and contracts) in the Transmission Construction Branch.

**Mr. D. M. Porter** has been appointed administrative officer to the Transmission Project Group and **Mr. H. V. Flaxman** engineer-in-charge of the drawing office.

**Mr. J. P. Featherstone**, who has been director of home sales for the J. I. Case Co., Ltd., since its formation in January last, has been appointed to the board.

## OBITUARY

**Mr. Alexander Kelso**, M.I.E.E., manager of the Glasgow Area of the South of Scotland Electricity Board, died on 28th November, aged 62. Mr. Kelso, who was born at Cowdenbeath, received his technical education at the Fife Engineering College and Heriot-Watt College. After the 1914-18 war, in which he served as a pilot in the R.F.C. and R.A.F., he was for a number of years with the Fife Electric Power Co. before going to Harrogate where, from 1939 to 1948, he was borough electrical engineer and manager. Mr. Kelso was chairman of the North Midland Centre of the Institution of Electrical Engineers in 1945-46.

**Mr. J. D. Spark**.—The death occurred in a nursing home on 2nd December, at the age of 80, of Mr. Joseph Duncan Spark, M.I.E.E., a

former borough electrical engineer of Willesden.

**Mr. J. W. J. Townley**.—The death occurred on 29th November of Mr. James William John Townley, C.B.E., M.I.E.E., who until his retirement in 1953 was manager of the North Eastern Sub-Area of the London Electricity Board. He was seventy-five. Mr. Townley was born at Paisley and was educated at the local technical college and the Manchester School of Technology. He later held appointments in the Paisley, Trafford, Ashton-under-Lyne, Manchester, Sunderland and Barnsley electricity undertakings. Then he became deputy city electrical engineer at Bradford in 1922 and was subsequently chief electrical engineer

of the L.C.C. Tramways and borough electrical engineer of West Ham, from 1930 to 1948, when he joined the London Electricity Board. He was appointed C.B.E. in 1946.

**Mr. J. R. Spanswick**.—The death occurred in hospital on 4th December, at the age of 49, of Mr. John Roland Spanswick, B.Sc., A.M.I.E.E., M.I.Mech.E., sales manager of the Thermal Process Section, Metal Industries Division of the English Electric Co., Ltd. From 1935 Mr. Spanswick was with the Electric Furnace Co., becoming chief engineer and manager of the Engineering Department in 1952 and a director in 1955. He joined the English Electric Co. in 1959.

## 400 kV Transmission for Britain

THE existing 275 kV supergrid is to be uprated to 400 kV and the first line should be in operation by 1965. Although there is no great economic advantage to be gained by the use of the higher voltage in Britain, the Central Electricity Generating Board has decided to adopt 400 kV since the resulting higher power carrying capacity will mitigate the impact of transmission development on amenities. The number of high-voltage transmission lines needed to meet the country's increasing power demands will be reduced by the conversion to the higher voltage.

The majority of existing 275 kV lines were originally designed with an eye to future conversion to 380 kV, and where increased transmission capacity is necessary they will be re-insulated and used for the new high voltage. The power carrying capacity per double-circuit line will thereby be raised from 1,200 to 2,000 MW.

For new main trunk lines, the Board plans to introduce a new design of tower carrying four conductors per phase, as compared with two per phase on the 275 kV lines. The new towers will, of necessity, be about 20ft taller than existing 275 kV towers, but this disadvantage will be outweighed by a further increase in power carrying capacity to 3,000 MW.

Technology is judged to be far enough advanced for orders for equipment to be placed without waiting for operating experience with the 380 kV experimental circuit between Monk Fryston and High Marnham which will come into service in 1962. The first 400 kV line should come into commercial use in 1965 and, from then

on, the new voltage will be introduced gradually to meet growing demands on the system.

Modifications to existing lines to suit 400 kV will include substituting a different type of insulator on the existing towers together with the provision of new transformers and switchgear at terminal substations. The change-over will be carefully worked out to maintain security of supplies to consumers and to cope with the growing demand while taking lines out of service successively for conversion.

The adoption of 400 kV will bring this country to the fore in the field of high-voltage electrical power transmission; it is the highest voltage in commercial use outside the U.S.S.R. It will furnish British manufacturers with valuable experience which will be of help to them in the competition for overseas markets.

## Information on Transducers

The Analogue Data Processing Technical Committee of the Electronic Engineering Association is compiling a list of the available types of transducers. It is collating information not only on current types but also on those under development and seeks the help of manufacturers or users outside the membership of the Association, who will be given the full results of the survey. A questionnaire indicating the information required is available on application to Mr. J. F. Richardson, Technical Secretary, Electronic Engineering Association, 11, Green Street, London, W.1.



## Financial Section

# STOCKS and SHARES

FIRST reactions to the unembroidered announcement that the merger talks between the General Electric and English Electric Companies had been abandoned put the former company's shares lower, at 30s, and raised those of English Electric to 32s 9d. Later, English Electric moved down a few pence and G.E.C. recovered actively to 32s before going back to 30s 9d. Inevitably there has been a revival of the various conjectures—most of them coupled with the name of E.M.I.—which were circulating freely around G.E.C. shares up to the time of the announcement that the possibility of amalgamation with English Electric was being explored. Sir Leslie Gamage, who will be succeeded as chairman of G.E.C. by Mr. Arnold Lindley at the end of the year, was reported to have said that no other negotiations were under discussion.

### Market Conditions

Although Stock Exchange markets have continued to reflect the heightening of caution in assessments of early trading and economic prospects both at home and overseas, selling was again reported to have been far from heavy and to have encountered rather more resistance from buyers tempted by the lower level of prices. There was a useful rally from the previous week's very sharp reverse, and while the tone was still distinctly uneasy at the beginning of this week, there was a good deal more stability in the movement of prices. Activity is at a low ebb, and in such conditions it is well to remember that a small amount of business either way is apt to have a disproportionately large effect upon prices.

### Extent of the Fall

The setback which affected the industrial market at the end of last month took the average of leading share prices under the previous lowest point of the year: this had been registered in May, at the time of the new credit and hire-purchase regulations. The subsequent recovery was only moderate, but even so there remained a difference of no more than 12 per cent between current prices and the record figures at the beginning of the year. Among recent changes, an improvement in those concerned with the Pye-Ekco merger was noteworthy. On the other

tack, Richardsons Westgarth fell further on news of the passing of the interim dividend.

### Electrical Shares

The behaviour of the average figure for industrial share prices has of course

concealed some very considerable differences between movements in various branches of the market. In the wide field covered by the electrical sections, for instance, many of the shares associated with both the heaviest and the lightest ends of the industry have

## Price Changes in

| Company or Board          | Nom.<br>Value | Middle<br>price<br>5th Dec. | Week's<br>Rise<br>or<br>Fall | Dividend      |       | Yield % | 1960         |             |
|---------------------------|---------------|-----------------------------|------------------------------|---------------|-------|---------|--------------|-------------|
|                           |               |                             |                              | Pre-<br>vious | Last  |         | High-<br>est | Low-<br>est |
| Gilt-edged Stocks         |               |                             |                              |               |       | £ s d   |              |             |
| Brit. Elec. 1968/73       | 100           | 74½                         |                              | 3             | 3     | 4 0 6   | 79½          | 74          |
| Brit. Elec. 1974/77       | 100           | 70½                         |                              | 3             | 3     | 4 5 0   | 76           | 69          |
| Brit. Elec. 1976/79       | 100           | 73                          |                              | 3½            | 3½    | 4 16 0  | 79½          | 72½         |
| Brit. Elec. 1974/79       | 100           | 82                          |                              | 4½            | 4½    | 5 3 9   | 90½          | 81          |
| Brit. Elec. 1967/69       | 100           | 91                          |                              | 4½            | 4½    | 4 19 0  | 97½          | 90          |
| Overseas Electric Supply  |               |                             |                              |               |       |         |              |             |
| Calcutta Elec.            | £1            | 20/-                        |                              | 7†            | 7½†   | 12 4 0  | 21/-         | 19/3        |
| East African Power        | £1            | 14/-                        | -9d                          | 8             | 10    | 14 5 6  | 20/3         | 14/-        |
| Nigerian Elec.            | £1            | 16/3                        |                              | 8             | 10    | 12 6 3  | 19/9         | 15/6        |
| Perak Hydro-Elec.         | £1            | 18/-                        |                              | 10            | 10    | 11 2 3  | 21/-         | 15/3        |
| Electrical Shares         |               |                             |                              |               |       |         |              |             |
| Aberdare Holdings         | 5/-           | 14/6                        |                              | 17½           | 17½   | 6 0 9   | 19/-         | 14/6        |
| Aerialite                 | 1/-           | 6/6                         | +3d                          | 54            | 54    | 8 7 0   | 9/6          | 6/3         |
| Allen, W. H.              | £1            | 38/9                        |                              | 12            | 14    | 4 16 6* | 43/9         | 34/6        |
| Allied Insulators         | 5/-           | 9/-                         | -6d                          | —             | 20    | 5 11 0* | 11/6         | 9/-         |
| Alwyn Holdings            | 5/-           | 24/-                        | +6d                          | —             | 12½   | 2 12 0  | 30/6         | 17/9        |
| Anglo-Portuguese Tel.     | £1            | 23/9                        | -6d                          | 9             | 9     | 7 11 6  | 29/-         | 22/6        |
| Arcoelectric              | 1/-           | 4/3                         |                              | —             | 15    | 3 10 6  | 5/6          | 4/-         |
| Aron Meters               | £1            | 71/6                        |                              | 15            | 15    | 4 4 0   | 90/-         | 47/-        |
| Assoc. Elec. Ind. Ord.    | £1            | 41/3                        |                              | 15            | 15    | 7 5 6   | 66/6         | 41/3        |
| Automatic Tel. & El.      | 5/-           | 14/6                        | -6d                          | 17            | 17    | 5 17 3  | 21/9         | 14/6        |
| Babcock & Wilcox          | £1            | 33/6                        |                              | 13            | 9     | 5 7 6   | 48/9         | 33/3        |
| Bakelite                  | 10/-          | 44/6                        | -6d                          | 15            | 17½   | 3 5 9*  | 52/-         | 33/6        |
| Baldwin, H. J.            | 2/-           | 2/-                         |                              | 20            | —     | —       | 2/6          | 1/9         |
| Berry's Electric          | 5/-           | 49/6                        |                              | 30            | 40†   | 4 0 9   | 51/6         | 29/6        |
| Bowthorpe Holdings        | 2/-           | 8/-                         | -3d                          | 27            | 18½*  | 4 12 6  | 11/6         | 7/9         |
| Brit. Elec. Resistance    | 2/-           | 9/6                         |                              | 15            | 17½   | 3 13 9  | 10/3         | 5/6         |
| Brit. Elec. Traction:     |               |                             |                              |               |       |         |              |             |
| Def. Ord. "A"             | 5/-           | 43/-                        | -6d                          | 35            | 40    | 4 13 0  | 49/3         | 42/-        |
| B.I. Callender's          | £1            | 50/-                        | +1/3                         | 13½           | 13½   | 5 8 0   | 61/-         | 47/9        |
| B.I. Callender's 6% Pref. | £1            | 19/-                        |                              | 6             | 6     | 6 6 3   | 21/-         | 18/6        |
| British Thermostat        | 5/-           | 32/6                        |                              | 35            | 20*   | 3 1 6   | 32/6         | 21/3        |
| Brook Motors              | 10/-          | 47/9                        |                              | 25            | 25*   | 4 9 9*  | 53/6         | 43/9        |
| Bulgin, A. F.             | 1/-           | 8/3                         | -3d                          | 50            | 55    | 4 9 0*  | 10/3         | 8/-         |
| Bulpitts                  | 5/-           | 17/3                        | -9d                          | 15            | 16½   | 4 14 3  | 23/3         | 16/9        |
| Burco Dean                | 5/-           | 8/9                         |                              | 18            | 15½   | 8 11 6  | 15/9         | 8/9         |
| Cable & Wireless          | 5/-           | 15/3                        | -9d                          | 10            | 10*†  | 3 5 6   | 18/3         | 14/3        |
| Cambridge Instruments     | 5/-           | 31/6                        |                              | 11½†          | 12½†  | 3 5 0   | 33/-         | 24/9        |
| Chloride El. Storage "A"  | £1            | 75/-                        | -3d                          | 20            | 17½*  | 4 13 3  | 81/-         | 65/6        |
| Clarke Chapman            | £1            | 46/3                        | -1/9                         | 13½           | 13½   | 5 19 0  | 63/9         | 45/-        |
| Cole, E. K.               | 5/-           | 20/-                        | +1/6                         | 20            | 22½   | 5 12 6  | 31/9         | 18/6        |
| Combined Elec. Mfrs.      | 4/-           | 8/-                         | -6d                          | —             | 12½†  | 6 5 0   | 8/6          | 8/-         |
| Contacteur Switchgear     | 5/-           | 14/9                        |                              | 14            | 14    | 4 15 0  | 17/9         | 14/6        |
| Cossor, A. C.             | 5/-           | 5/-                         |                              | 5             | Nil   | —       | 10/-         | 5/-         |
| Crabtree                  | 10/-          | 27/6                        |                              | 20            | 12½*  | 4 11 0  | 39/6         | 24/-        |
| Crompton Parkinson        | 5/-           | 11/3                        |                              | 14            | 12½*  | 5 11 0  | 15/-         | 10/9        |
| Davis & Timmins           | 5/-           | 31/-                        | -6d                          | 20*           | 30†   | 4 16 9  | 35/-         | 17/-        |
| De La Rue                 | 10/-          | 55/-                        |                              | 22½           | 22½*† | 4 1 9   | 78/6         | 47/9        |
| Decca "A"                 | 10/-          | 49/-                        | -6d                          | 20            | 23½   | 4 15 6  | 51/3         | 40/9        |
| Desoutter                 | 5/-           | 50/-                        |                              | 21½           | 30    | 3 0 0   | 50/-         | 37/6        |
| Dewhurst                  | 2/-           | 7/6                         | -3d                          | 20            | 20    | 5 6 9   | 8/6          | 7/-         |
| Dictograph Tel.           | 2/-           | 8/6                         | -6d                          | 20            | 20*   | 4 14 3  | 9/9          | 7/9         |
| Dimplex                   | 5/-           | 45/6                        | +2/-                         | —             | 30    | 2 15 0* | 48/-         | 22/6        |
| Dubilier Condenser        | 1/-           | 2/3                         |                              | 25            | 30    | 6 13 3* | 3/3          | 2/3         |
| Duport                    | 5/-           | 20/-                        | -2/-                         | 17½           | 20    | 5 0 0   | 30/3         | 20/-        |
| E.M.I.                    | 10/-          | 41/9                        |                              | 20            | 17½*  | 4 3 9   | 58/9         | 41/9        |
| Electrical Apparatus      | 5/-           | 15/9                        | -6d                          | 14½           | 20    | 6 7 0   | 18/3         | 12/9        |
| Electrical Components     | 5/-           | 9/6                         |                              | 15            | 11½*  | 6 1 0   | 13/9         | 9/6         |
| Elec. Construction        | £1            | 32/6                        | -1/9                         | 9             | 9     | 5 10 9  | 43/-         | 31/3        |
| Elliott-Automation        | 5/-           | 24/6                        | -6d                          | 9.3           | 12½   | 2 9 0   | 36/-         | 19/9        |
| Enfield Rolling Mills     | £1            | 46/6                        | -1/-                         | 15            | 15    | 6 9 0   | 56/-         | 46/6        |
| Engineering & Lighting    | 2/-           | 8/-                         | +3d                          | 20            | 20    | 5 0 0   | 8/9          | 5/-         |

The above quotations are based upon middle prices in the Stock Exchange Daily Official List.

\* After scrip issue.

† Free of income tax.

‡ Dividend indicated.



suffered considerably more than average depreciation. In the case of the major electrical groups, and the heavy engineering firms associated with them, the fall since January measures up to about 30 per cent, or more than twice the general experience, while there have

been abnormally serious casualties also among investments in the fields of domestic equipment, television, radio and motor accessories. Over the broader ranges of electrical engineering, however, performances have compared satisfactorily with those in other sectors,

while in Berry's Electric Magicoal and Dimplex this market is going to have strong contenders for any award to the share-of-the-year.

### Metal Industries Outlook

In maintaining the interim dividend at 6 per cent on account of the current year, Metal Industries reported recently that group profits for the six months to the beginning of October amounted to £1,132,000, but the chairman was still expecting, with the usual reservations, that earlier estimates of a total of £2½ million for the full year would be realised. Sir Charles Westlake said that orders were 30 per cent higher than they had been at the same time last year. Profits of the original M.I. group in the first part of the year appear to have been little changed at £722,000, in comparison with the same half of 1958-59, while the newly-acquired Lancashire Dynamo group contributed £448,000 for a 32-week period. On capital increased to £7.5 million as a result of the L.D. acquisition and a subsequent "rights" issue, dividends totalling 15 per cent have been forecast. At 53s, the £1 shares stand at about 20s below the top prices recorded early in the year.

### Simms Issue

Simms Motor and Electronics 5s shares have maintained their value better than most of those associated with the motor industries over the past month or two. They are now quoted "ex" a one-for-ten scrip issue, the price of the old shares being about 17s, with the new a few pence higher by virtue of being transferable free of stamp duty for the time being. A few months earlier there was an issue of shares for cash to finance important new acquisitions in the field of electronics and developments in other branches of the group's business. At that time trading operations were said to be progressing satisfactorily and the directors envisaged a dividend of not less than 15 per cent, on the increased capital, for the year ending this month.

### Electrical Apparatus

Net profits of the Electrical Apparatus Co. improved to £141,000 in the year ended in July, and provided twofold cover for the dividend of 20 per cent. This represents a substantial advance on the rate of 14½ per cent paid on the two previous occasions, and gives a yield of over 6½ per cent on the 5s shares at their recent price of 15s 9d. In the latest balance sheet reserves were shown to be rather larger than the £563,000 issued ordinary capital, while net liquid assets were above the million mark. Factory extensions are in hand and new acquisitions have been made at a cost of about £180,000.

## Electrical Investments

| Company or Board               | Nom.<br>Value | Middle<br>price<br>5th Dec. | Week's<br>Rise<br>or<br>Fall | Dividend      |       | Yield % | 1960         |             |
|--------------------------------|---------------|-----------------------------|------------------------------|---------------|-------|---------|--------------|-------------|
|                                |               |                             |                              | Pre-<br>vious | Last  |         | High-<br>est | Low-<br>est |
| Electrical Shares—continued    |               |                             |                              |               |       | £       | s            | d           |
| English Electric ...           | £1            | 32/6                        | +1/3                         | 14            | 10*   | 6       | 3            | 0           |
| English Electric 3½% Pref. ... | £1            | 11/9                        |                              | 3½            | 3½    | 6       | 7            | 9           |
| Ericsson Tel. ...              | 5/-           | 21/-                        | +6d                          | 13½           | 13½   | 5       | 1            | 6           |
| Ever Ready ...                 | 5/-           | 30/9                        | -9d                          | 27½           | 20*   | 3       | 5            | 0           |
| Falk Stadelmann ...            | £1            | 23/-                        | -6d                          | 10            | 7½    | 6       | 10           | 6           |
| G.E.C. ...                     | £1            | 30/9                        | -3d                          | 10            | 10    | 6       | 10           | 0           |
| G.E.C. 6½% Pref. ...           | £1            | 20/6                        |                              | 6½            | 6½    | 6       | 6            | 9           |
| General Cables ...             | 5/-           | 4/3                         |                              | 15            | Nil   | —       |              |             |
| Goblin (B.V.C.) ...            | 5/-           | 6/3                         |                              | 7½            | 12½   | 10      | 0            | 0           |
| Hackbridge Holdings ...        | 5/-           | 5/9                         | -6d                          | 20            | 20    | 8       | 14           | 0*          |
| Harland Engineering ...        | 5/-           | 15/-                        |                              | 14            | 16*   | 5       | 6            | 9           |
| Head Wrightson ...             | 5/-           | 21/3                        | -9d                          | 20            | 14*   | 3       | 5            | 0           |
| Heatrae ...                    | 2/-           | 12/6                        | +1/3                         | 20            | 22½   | 3       | 12           | 0           |
| Holophone ...                  | 5/-           | 18/-                        | -6d                          | 26            | 30    | 8       | 6            | 9           |
| Hoover ...                     | 5/-           | 47/6                        | +6d                          | 60            | 90    | 4       | 14           | 9*          |
| Hunt, A. H. ...                | 4/-           | 18/-                        | -9d                          | 15            | 20    | 4       | 9            | 0           |
| Intl. Combustion ...           | 5/-           | 23/9                        | -1/3                         | 30            | 30    | 6       | 6            | 3           |
| Intl. Computers & T. ...       | £1            | 62/-                        |                              | —             | 10    | 3       | 4            | 6           |
| Johnson & Phillips ...         | £1            | 18/-                        | +3d                          | 5             | Nil   | —       |              |             |
| Kenwood Mfg. ...               | 1/-           | 6/-                         | -9d                          | —             | —     | —       |              |             |
| Laurence Scott ...             | 5/-           | 16/3                        | -9d                          | 15            | 15*   | 4       | 12           | 3           |
| Lister, R. A. ...              | £1            | 52/-                        |                              | 12½           | 14    | 5       | 7            | 9           |
| Lucas, J. ...                  | £1            | 59/6                        | +6d                          | 12½           | 13½   | 4       | 12           | 6           |
| Marryat & Scott ...            | 2/-           | 14/9                        |                              | 22½           | 27½   | 3       | 14           | 6           |
| Mather & Platt ...             | £1            | 43/9                        | -9d                          | 10½           | 11    | 5       | 0            | 6           |
| Metal Industries ...           | £1            | 53/-                        | -6d                          | 14            | 15    | 5       | 13           | 3           |
| Midland Elec. Mfg. ...         | £1            | 58/9                        |                              | 10            | 12    | 4       | 1            | 9           |
| Murex ...                      | £1            | 37/6                        | -1/3                         | 15            | 20    | 6       | 2            | 0*          |
| Newman Ind. ...                | 2/-           | 5/3                         |                              | 10            | 12½   | 4       | 15           | 3           |
| Oldham & Son ...               | 1/-           | 2/3                         |                              | 17½           | 17½*± | 7       | 15           | 6           |
| Parsons, C. A. ...             | £1            | 46/3                        | -1/3                         | 8½            | 9½    | 4       | 1            | 0           |
| Philips' Lamps ...             | FL10          | 220/-                       |                              | 13-3          | 17    | 1       | 11           | 0           |
| Plessey ...                    | 10/-          | 44/-                        | +3d                          | 15½±          | 17½   | 3       | 17           | 3           |
| Pullin, R. B. ...              | 2/-           | 12/3                        | +6d                          | 25            | 25    | 4       | 1            | 9           |
| Pye ...                        | 5/-           | 13/6                        | +1/-                         | 12½           | 15    | 5       | 11           | 0           |
| Pyrotex ...                    | 5/-           | 45/6                        | -2/-                         | 34            | 40    | 4       | 8            | 0           |
| Radiation ...                  | £1            | 28/3                        | -6d                          | 6             | 12    | 8       | 9            | 6           |
| Reliance-Clifton ...           | 5/-           | 22/6                        | -1/-                         | 15            | 15    | 3       | 6            | 9           |
| Reyrolle ...                   | £1            | 37/-                        | 17½                          | 17½           | 17½   | 4       | 14           | 6*          |
| Richardsons Westgarth ...      | 10/-          | 6/6                         | -9d                          | 8½            | 8½    | —       |              |             |
| Sangamo Weston ...             | 10/-          | 26/3                        |                              | 12½           | 11*   | 4       | 3            | 9           |
| Scott, James ...               | 5/-           | 27/6                        | -9d                          | 24            | 25*   | 4       | 11           | 0           |
| Simon Engineering ...          | 5/-           | 29/-                        | +1/-                         | —             | 26-6½ | 4       | 12           | 0           |
| Smith (England), S. ...        | 4/-           | 16/9                        |                              | 17½           | 20    | 4       | 15           | 6           |
| Southern Areas ...             | £1            | 14/9                        |                              | Nil           | 5     | 6       | 15           | 6           |
| Strand Elec. ...               | 5/-           | 12/9                        | +3d                          | 20            | 14-6* | 5       | 14           | 3           |
| Sturtevant ...                 | 5/-           | 13/9                        |                              | 15½           | 15½   | 9       | 0            | 0           |
| Sun Elec. ...                  | 5/-           | 16/6                        | -1/-                         | 15            | 18½   | 5       | 12           | 0           |
| T.C.C. ...                     | 10/-          | 42/-                        |                              | 25            | 39    | 5       | 13           | 6*          |
| Telephone Rentals ...          | 5/-           | 21/3                        | -6d                          | 12½           | 15*   | 3       | 10           | 6           |
| Thompson (John) ...            | 5/-           | 15/-                        | -6d                          | 25            | 20    | 6       | 13           | 3           |
| Thorn Elec. ...                | 5/-           | 45/6                        | -6d                          | 20            | 25    | 2       | 15           | 0           |
| Thornycroft ...                | £1            | 23/9                        | -1/3                         | 6             | 6     | 5       | 1            | 0           |
| Tube Investments...            | £1            | 72/9                        | +1/6                         | —             | 14    | 3       | 17           | 0           |
| Ultra Electric ...             | 5/-           | 14/3                        | -6d                          | 20            | 25    | 8       | 15           | 6           |
| Walsall Conduits ...           | 4/-           | 10/9                        | -6d                          | 22½           | 15*   | 5       | 11           | 6           |
| Ward & Goldstone ...           | 5/-           | 28/6                        | +1/9                         | 30            | 35    | 3       | 1            | 6*          |
| Watford ...                    | 2/-           | 9/9                         | +1/6                         | 25            | 25    | 4       | 2            | 0*          |
| Westinghouse ...               | £1            | 40/-                        |                              | 10            | 11    | 5       | 10           | 0           |
| West, Allen ...                | 5/-           | 11/-                        |                              | 12½           | 12½*  | 5       | 13           | 9           |
| Wilkins & Mitchell ...         | 5/-           | 13/9                        | +3d                          | 17            | 21*   | 7       | 12           | 9           |
| Wolf Electric ...              | 5/-           | 13/9                        | -6d                          | 10            | 12½   | 4       | 11           | 0           |



## REPORTS and DIVIDENDS

**Richardsons, Westgarth & Co., Ltd.**—No interim dividend is being paid this year (against 3½ per cent last year). Announcing this, the board states that it is hoped to make a reduced distribution when the full results are known. At the annual meeting last June the chairman, Mr. O. J. Philipson, said that with the present trend of costs and low price levels a further fall in profits would seem to be inevitable, with a consequent reduction in the dividend; in this respect, however, the board would continue to have regard to long-term considerations, including the state of the order book and the course of the large contracts which extended over several years.

**Garrard Engineering & Manufacturing Co., Ltd.**—The offers by the Plessey Co. to acquire the Garrard ordinary and preferred ordinary shares not already owned by them have been accepted in respect of over 90 per cent of both classes and have become unconditional.

**Bakelite, Ltd.**, has declared an interim dividend of 6 per cent (the same).

**Telephone Rentals, Ltd.**, announce an interim dividend of 5 per cent (the same).

### Increases of Capital

**Ultra Electric (Holdings), Ltd.**—Increased on 26th April by £250,000 in 5s ordinary shares, beyond the registered capital of £750,000.

**Bylock Electric, Ltd.**—Increased on 24th March by £105,000 in 1s "A" non-voting ordinary shares, beyond the registered capital of £145,000.

**Modern Telephones (Service and Supply), Ltd.**—Increased on 14th April by £59,900 in 1s ordinary shares, beyond the registered capital of £100.

**Oerlikon Electrodes (Great Britain), Ltd.**—Increased on 31st March by £100,000 in 1s ordinary shares, beyond the registered capital of £100,000.

**Morheat, Ltd.**—Increased on 15th March by £19,000 in 9,000 ordinary and 10,000 preference shares of 1s each, beyond the registered capital of £1,000.

**Radio Heaters, Ltd.**—Increased on 30th March by £100,000 in 500,000 deferred and 1,500,000 unclassified shares of 1s each, beyond the registered capital of £150,000.

**Isopad, Ltd.**—Increased on 1st April by £55,000 in 1s ordinary shares, beyond the registered capital of £5,000.

### New Companies

**T. Carnell (Electric), Ltd.**—Registered 31st October. Capital £5,000. Directors: T. A. Carnell (secretary) and Mrs. Margaret M. Carnell. Regd. office: 68, Glencoe Road, Sheffield.

**Wilson & Harper, Ltd.**—Registered 18th November. Capital £5,000. To acquire the business of electrical contractors carried on by D. Wilson and G. H. Harper at Macclesfield, Ches., etc. Directors: D. Wilson, Mrs.

Norma C. Wilson, G. H. Harper (secretary) and Mrs. Violet M. Harper. Regd. office: 29, Cross Street, Macclesfield.

**Holland Electrical (Dorking), Ltd.**—Registered 21st November. Capital £1,000. Directors: J. C. Knight and J. Holland (secretary). Regd. office: The Forge, Ockley, Surrey.

**H. White (Electrical Contractors), Ltd.**—Registered 2nd November. Capital £2,500. To acquire the business carried on by H. White at Merthyr Tydfil, and to carry on the business of electrical engineers, etc. Directors: H. White and Mrs. Rosina White (secretary). Regd. office: 10, Dynevor Street, Georgetown, Merthyr Tydfil.

**Lancastrian Industrial & Domestic Appliances, Ltd.**—Registered 2nd November. Capital £5,000. Manufacturers, designers, maintainers, reconditioners, repairers, exporters and importers of and dealers in electrical apparatus and goods, etc. Directors: J. Wrathall, T. Carter, J. Clarke, D. R. Adams, H. Jessop, J. Hacking and G. C. White. Secretary: Austin J. Pilley. Regd. office: White Lund, Morecambe, Lancs.

**J. Barnes (Electrical), Ltd.**—Registered 1st November. Capital £5,000. Electrical engineers and general electrical installation contractors, etc. Directors: J. Barnes, H. Pearson and A. K. Seares. Secretary: Barbara F. Tipton. Regd. office: 4, Oxford Street, Salford.

### Receivers Appointed and Released

**Radar Electronic Machine Tools, Ltd.**—Mr. F. P. Maddison, of Wilkin House, Staines Road, Feltham, Middx., ceased to act as receiver and/or manager on 7th November.

**Deamer Sales, Ltd.**—Mr. F. Stafford, Natco Chambers, Princes Street, Stockport, was appointed receiver on 7th October, 1960, under powers contained in debenture dated 17th June, 1960.

**L. & I. Clarke Electrical Co. (Portslade), Ltd.**—Mr. J. S. Bradley-Hole, of 7, Old Steine, Brighton, was appointed receiver and manager on 31st October, 1960, under powers contained in debenture dated 14th November, 1957.

### Meetings of Creditors

**New Malden Electrics, Ltd.**—Meeting 13th December, at W. H. Cork, Gully & Co., 19, Eastcheap, London, E.C.3.

**Perryvale Electrical Appliances, Ltd.**—Meeting 16th December at Room 43, Winchester House, Old Broad Street, E.C.2.

### Liquidations

**Pool Electrics (Blackpool), Ltd.**, electrical engineers and dealers, 13, Cookson Street, Blackpool.—Winding up voluntarily. Liquidator, Mr. J. L. Hague, Bank Chambers, 7, South King Street, Blackpool, appointed by creditors on 17th November.

**Leslies Electricals, Ltd.**, electrical contractors and dealers, 112, Crescent Road, Reading, Berks.—Winding up voluntarily. Liquidator, Mr. H. I. Tibbury, of the above address, appointed by creditors and the company on 14th November.

**Ideal Electrics (Middlesbrough), Ltd.**, electrical appliance dealers, 283, Linthorpe Road, Middlesbrough.—Liquidator, Mr. R. W. Hellyer, Brotherton Chambers, Westgate, Leeds, appointed by creditors on 18th November. Particulars of claims to the liquidator by 31st December.

**Kendridge, Ltd.**, dealers in radio, television, domestic appliances, etc., 16, Catherine Place, London, S.W.1.—Winding up voluntarily. Liquidators, Mr. R. A. Hawken, Bank Chambers, 1, John Street, Bedford Row, London, W.C.1, and Mr. G. A. Wale, Walter House,

418-422, Strand, London, W.C.2, appointed by company and creditors on 16th November.

**Gould, Roberts & Co., Ltd.**, radio, television and electrical dealers, 139, City Road, Cardiff.—Winding up voluntarily. Liquidator, Mr. S. Chater, 35, Windsor Place, Cardiff, appointed by members and creditors on 14th November.

**Falconar Cross & Co., Ltd.** (Members' voluntary winding-up).—Meeting of members 29th December at 16, Market Street, Newcastle-upon-Tyne, to receive an account of the winding-up by the liquidator, Mr. E. M. Robinson.

**Madras Electric Supply Corporation, Ltd.** (Members' voluntary winding-up).—Meeting of members 30th December at 30, Cursitor Street, Chancery Lane, London, E.C.4, to receive an account of the winding-up by the liquidator, Mr. H. Wilcock.

**H. V. Colman & Co. (Electrical Contractors), Ltd.**, 12, Shaw's Passage, Park Street, Birmingham.—Liquidator, Mr. W. L. Hand, Colmore House, 21, Waterloo Street, Birmingham, released 21st April, 1960.

**Leamington Electrical Installations, Ltd.**—Winding up voluntarily. Liquidator, Mr. R. F. Bendall, 126, Colmore Row, Birmingham, 3, appointed by the company on 21st November.

### Bankruptcies

**L. W. Brown**, radio, television and electrical engineer, carrying on business at 18, Lower Lux Street, Liskeard, Cornwall.—Last day for receiving proofs for dividend 13th December. Trustee, Mr. A. D. Gwyther, First Floor, Royal Building, St. Andrew's Cross, Plymouth.

**C. R. Clarke**, electrical contractor, lately trading at Kingham Way, Luton.—Last day for receiving proofs for dividend 10th December. Trustee, Mr. C. A. Taylor, 15, Guildhall Road, Northampton.

**C. Davies**, electrical contractor, 39, Moss Brow, West Bollington, Ches.—Last day for receiving proofs for dividend 12th December. Trustee, Mr. G. H. Eaves, 47, Mosley Street, Manchester.

**W. B. McKelvey**, electrical contractor, carrying on business at 2, High Road, Drayton, Norfolk.—Last day for receiving proofs for dividend today (Friday). Trustee, Mr. C. A. Taylor, Norfolk House, Exchange Street, Norwich.

**B. G. Firman**, electrician, formerly carrying on business as Extol Electrics at 1, Hopewell Terrace, Elvington, Yorks.—First meeting held 8th December. Public examination 24th January at the Shirehall, Norwich.

### PRICES OF MATERIALS

In the accompanying table we give the basis prices of the more important materials used in the electrical industry. The figures given are the selling prices and are those quoted on Tuesday last.

|                           |     |       |      |       |    |
|---------------------------|-----|-------|------|-------|----|
| ALUMINIUM ingots          | ton | £186  | os   | od    |    |
| COPPER, H.C. Electro      | ton | £234  | 5s   | od    |    |
| Fire Refined 99.70%       | ton | £233  | os   | od    |    |
| Fire Refined 99.50%       | ton | £232  | os   | od    |    |
| COOPER Tubes              | ..  | lb    | 2s   | 2½d   |    |
| Sheet                     | ..  | ton   | £266 | 10s   | od |
| H.C. wire and strip       | ..  | ton   | £283 | 15s   | od |
| LEAD, English             | ..  | ton   | £66  | 5s    | od |
| Foreign                   | ..  | ton   | £65  | os    | od |
| MERCURY                   | ..  | flask | £70  | 10s   | od |
| TIN, block (English)      | ..  | ton   | £799 | os    | od |
| ZINC, G.O.B. Foreign      | ton | £86   | 10s  | od    |    |
| BRASS Tubes (solid drawn) | ..  | lb    | 1s   | 10½d  |    |
| Wire                      | ..  | lb    | 2s   | 8½d   |    |
| PHOSPHOR BRONZE           | ..  | ..    | ..   | ..    | .. |
| Wire                      | ..  | lb    | 4s   | 0½d   |    |
| PLATINUM                  | ..  | oz    | £30  | 5s    | od |
| RUBBER, No. 1 R.S.S.      | ..  | ..    | ..   | ..    | .. |
| spot                      | ..  | lb    | 24½d | —24½d |    |



# from $-55^{\circ}\text{C}$ to $+155^{\circ}\text{C}$

## Plessey mark 5 connectors



This new range of aluminium Mark 5 connectors embodies the main features of the well-established Plessey Mark 4 connector plus additional characteristics for safe operation between  $-55^{\circ}\text{C}$  and  $+155^{\circ}\text{C}$ !

Designed specifically to provide thoroughly efficient and reliable service at the extended temperatures of modern requirements, the Mark 5 range has passed successfully Type Approval tests to the conditions specified in DEF 5321 (July 1958), maintaining a pressure sealing of 20 lb. p.s.i. between  $-40^{\circ}\text{C}$  and  $+155^{\circ}\text{C}$ . Where pressure sealing is not essential, efficient operation to  $-55^{\circ}\text{C}$  is attained. This standard of performance has resulted in the Mark 5 Connector being adopted by the Ministry of Aviation as the Pattern 104 connector.

Wiring and Connectors Division

**THE PLESSEY COMPANY LIMITED** • Cheney Manor • Swindon • Wilts • Swindon 6251

Overseas Sales Organisation: PLESSEY INTERNATIONAL LIMITED • ILFORD • ESSEX • ILFORD 3040

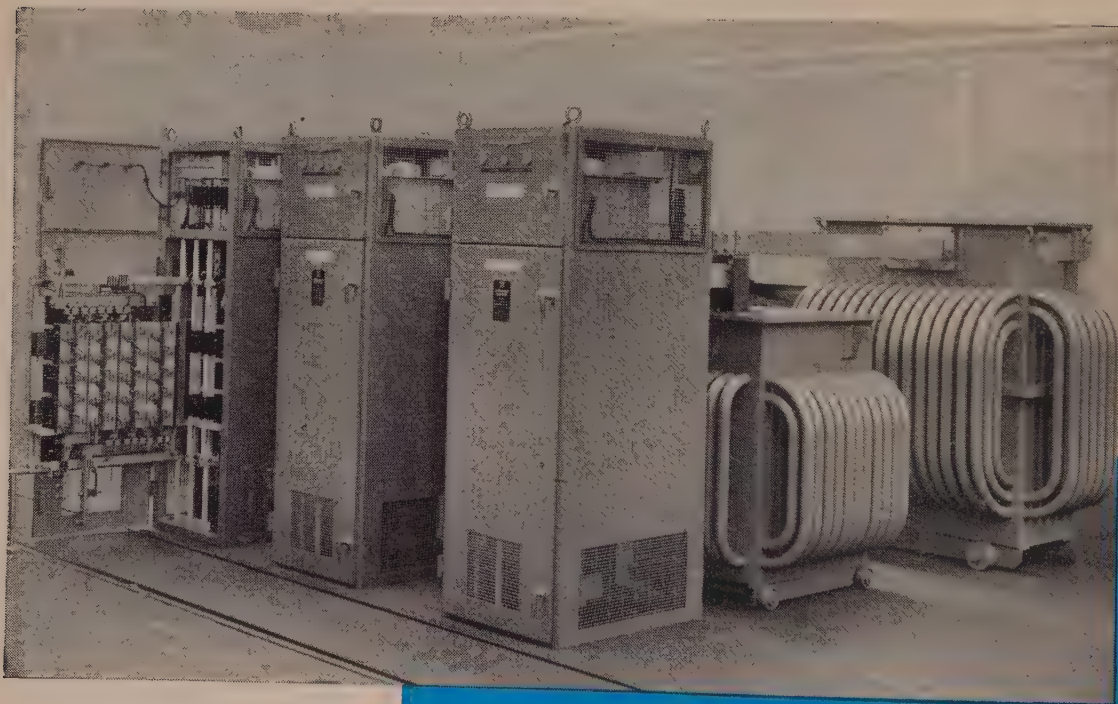




# POWER RECTIFIERS

**S I L I C O N  
G E R M A N I U M  
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for all  
**AC TO DC ★  
CONVERSION**



2000 AMPERE 110 volt GERMANIUM RECTIFIERS  
★ Our Specialist Engineers will be pleased to advise  
on YOUR problem.

THE ELECTRIC CONSTRUCTION COMPANY LTD · WOLVERHAMPTON



# Vessel Stress Relief by Radiant Heat

By P. J. COOPER, A.M.I.E.E.\*

Four methods of stress relieving circumferential welds are briefly described and the application of one particular method to the heat exchanger vessels for the Windscale advanced gas-cooled reactor is discussed

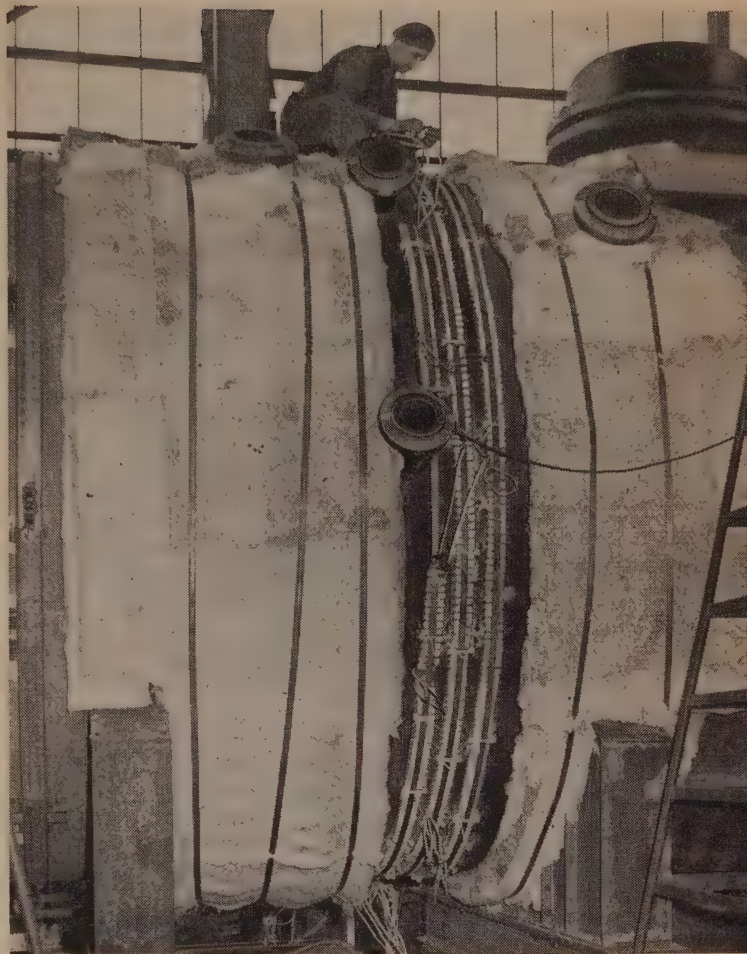
**T**HE nuclear power programme has accelerated the development of electrical radiant heat methods for stress relieving pressure vessels and heat exchangers. When a weld is being deposited, the pool of molten metal is rapidly cooled by the parent plate and the subsequent contraction sets up residual stresses which may rise to values as high as the yield strength itself. If these stresses are not relieved, they can ultimately lead to fracture. Welding also causes embrittlement and although the weld metal may be relatively plastic at normal temperatures, the embrittlement becomes more pronounced at sub-zero temperatures, thus causing rupture and tearing of the parent metal. Stress relieving lowers the tensile and yield strengths of the weld metal by about 10 per cent, but increases the ductility considerably. The requirements are set out in B.S. 1500:1958 and in A.S.M.E. codes, but, in general, a cherry red heat ( $600-650^{\circ}\text{C}$ ) is required, with slow cooling, the latter being most important.

There are four methods of stress relieving circumferential welds, as opposed to the stress relief of a complete vessel.

(1) *Gas*.—This involves the construction of a gas muffle and leads to difficulties in preventing flame impingement and pick-up of impurities in the plate. There is also difficulty in arranging for uniform temperatures around the periphery and the obtaining of suitable gradients away from the hot zone.

(2) *Induction*.—Heavy capital cost of the h.f. equipment is involved and the heating effect can be too local, resulting in severe gradients away from the weld. Also, because the inductor cables completely encircle the vessel several times, it is not possible to vary the heat in the plane of the cables and this can result in the bottom of the vessel being colder than the top.

(3) *Radiant heat using wire and beads*.—To overcome the disadvantages of the above two methods, use has been made of nickel chrome wire encased in ordinary fish-spine beads, the beaded wire being wound on the vessel, and mattress type lagging extending over the external and internal surfaces of the vessel. Welding sets are used as low-voltage power sources and, on large diameter vessels, it is not uncommon to find that well over twelve welding sets are required for one weld. Mains voltage cannot be used as ordinary fish-spine refractory is very sensitive to voltage stress when operating at  $650^{\circ}\text{C}$ .



*Heating elements being placed around a circumferential weld prior to the stress relieving of a heat exchanger for Windscale*

Even with this method, the temperature gradients can be too high.

(4) *Radiant heat using mains elements and hot box*.—This recently developed method employs finger type elements in sintered alumina sleeves, a very-high-grade ceramic which withstands voltage stress. To achieve better gradients, insulated bulkheads are fitted to the vessel, each one 3ft 6in away from the weld, to form a compartment inside the vessel. This is heated by coiled elements in sintered alumina sleeves, at mains voltage, a hot box resulting which ensures even temperatures top to bottom, side to side, and a gradual fall-off in temperature away from the hot zone.

## Application

The last method has recently been used in the circumferential stress relief of the joining welds on the Windscale advanced gas-cooled reactor heat exchangers being

\* Cooper Electroheat, Ltd.

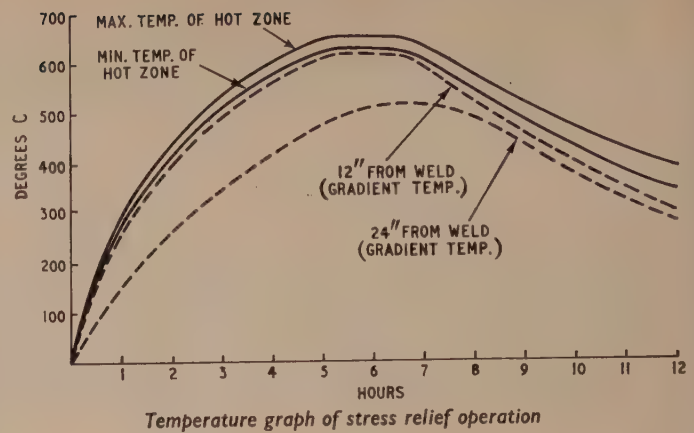


manufactured by International Combustion, Ltd., Derby. One particular section measured 11ft in diameter by 35ft long. This comprised two halves which had been welded together and, although each half had been satisfactorily stress relieved in the available conventional furnace, the section formed by the two halves became too large for furnace treatment and necessitated the closing circumferential weld being locally treated. The plate thickness at the weld was  $1\frac{7}{16}$ in, rising to  $2\frac{1}{2}$ in immediately after the weld on one side only. Within inches of the weld, several bosses protruded.

To obtain the necessary width of hot zone (six times the plate thickness, i.e. 9in), three complete bands of 4in wide finger type elements were placed around the periphery. These bands were formed out of five 7ft long 9 kW elements, connected in series, each forming one phase of a 415 V, three-phase, 50 c/s supply, giving a balanced load of 135 kW. Connections between elements were made outside the lagging so that the loading could be controlled by parallel resistors. The outside of the vessel was lagged from 6in over the elements down to 2in thickness at 6ft on each side of the weld. Two light frameworks, which were lagged to a thickness of 6in, were placed inside the vessel on either side of the weld so as to form insulated bulkheads. Each bulkhead was about 3ft 6in from the weld. Mild steel channels were placed between the bulkheads at one-third the diametrical height of the vessel. Nine coiled elements, forming an additional balanced load of 40 kW, were fixed to these internal supports.

Four chromel/alumel thermocouples were positioned around the weld on the inside, together with two more to indicate the width of the hot zone. Since these six couples were on the opposite side of the plate to the main heaters, a true plate temperature was obtained. Additional couples were placed on the outside of the vessel at 1ft intervals away from the weld, to indicate the temperature gradient. A 16-way temperature recorder provided a permanent record.

A temperature of 650°C was reached 5 hours after switch-on and held for the requisite  $1\frac{1}{2}$  hours, cooling being retarded by the use of the hot box elements after the main elements were switched off. The equalising effect of the hot box method can be appreciated from the fact that there was only 20°C temperature difference any-



where around the periphery. The temperature gradients were also acceptable, being 620, 520 and 390°C at 1ft intervals away from the weld.

The mains radiant heat principle, with its associated hot box, is the most easily applied and economical method of local stress relief and gives by far the best results.

Acknowledgments are made to International Combustion, Ltd., for their co-operation in the production of this article.

## Russo - Norwegian Power Development

FROM A CORRESPONDENT

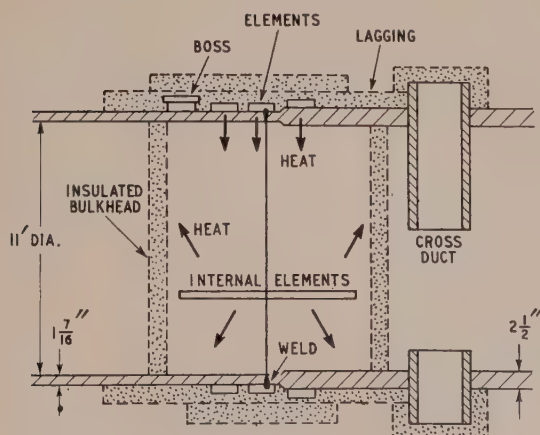
NORTH of the Arctic Circle, the River Pasvik forms the frontier between Norway and the Soviet Union for some 70 miles. This river rises in a Finnish lake and flows to the Arctic Sea and along its length common to the two countries there is a fall in water level of over 200ft.

To find the most economical way to make use of this power potential a joint committee was set up by Norway and Russia. They recommended that this 70 mile stretch of river should be formed into three stepped reservoirs and the impounded water used for power production. By agreement the upper and lower projects are to be developed by the Soviet Union, the electrical energy generated being used in Russia. The central scheme at Skofoss is to be built by Norway and the electrical power will be used in Norway.

The total estimated capacity of the Russian power plants at Boris Gleb, Hestefoss and Tengefoss will be 70 MW or 482 million kWh and the Norwegian plant will generate 64 MW or 370 million kWh. Three power plants are being constructed by the Soviet Union so as to reduce the area of inundation of forest and agricultural land at the uppermost water storage lake.

Each country will pay the compensation for damage and disturbances caused by the schemes in its own territory. During the building of the dams and generating stations each country will have the right of access across this common border. Each country may also make use of as much land of the other country as is necessary.

Work has only just begun on this scheme and as very little work can be carried out in the colder winter weather it is expected that it will be several years before the whole of the scheme is completed and in operation.



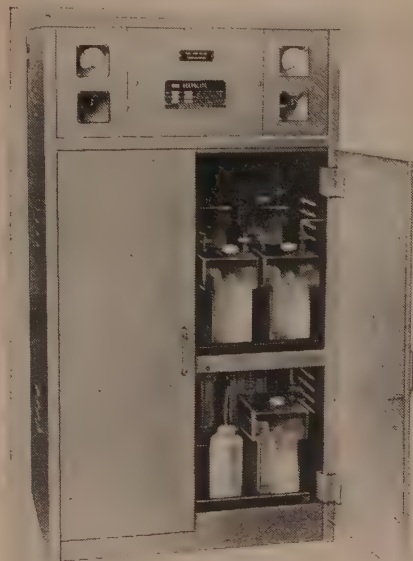
Disposition of heating elements for the stress relieving of a circumferential weld on a heat exchanger vessel for the Windscale A.G.R.



## NEW ELECTRICAL EQUIPMENT

### Emergency Lighting

Two self-contained "Keepalite Junior" emergency lighting equipments have been introduced by CHLORIDE BATTERIES, LTD., Exide Works, Clifton Junction, Swinton, Manchester. They are self-contained in steel cabinets and consist of a battery and a control and charging cubicle. In the SC/JKX unit the automatic switch is mounted on the



Chloride Batteries "Keepalite Junior" emergency lighting equipment

control cubicle, while the automatic switch in the SC/JSR version consists of a separate relay.

The battery in each equipment consists of 7, 13 or 26 Chloride cells, and, depending on the duty required, has a capacity of 15, 30, 45 or 60 Ah at the ten-hour rate of discharge. It is kept fully charged by a continuous trickle-charge from a rectifier inside the cubicle. The smallest cabinet measures 1ft 10½in wide by 1ft 1½in deep by 4ft high and the largest 3ft 5in wide by 1ft 6½in deep by 4ft 8in high.

### Arc-Welding Generator

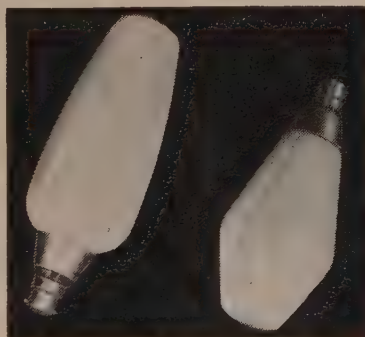
A new generator for their range of arc-welding sets has been designed by PETBOW, LTD., Sandwich, Kent. The main carcass is fabricated from mild steel in the form of two welded barrels which are spigoted and bolted together and the field coils are detachable without removing the armature or dismantling the complete carcass. The armature shaft is of high grade steel and the armature core pack, field poles and interpoles are built up of low loss, high permeability iron laminations.

Cooling is by a centrifugal fan which draws air from the drive end past the commutator and field coils. The field system provides continuous current adjustment between minimum and maximum at a nearly constant open circuit voltage, thus providing for all types of electrodes and techniques.

Two large handwheels give control of welding current and voltage. Approximately 8 kW at 65 V d.c., which is the maximum safe voltage for outdoor use, is available for the operation of hand tools, etc., when the machine is not required for welding duties. When one machine is running, other sets can be started by motoring from this set.

### Shadeless Tungsten Lamp

A new type of tungsten lamp that needs no shade is shortly to be marketed by the PHILIPS ELECTRICAL CO., LTD., Century House, Shaftesbury Avenue, London, W.C.2. The lamp, which is approximately 9in long, is produced in two distinctive contemporary shapes and is made in 60 W normal voltage ratings. Besides its unusual shape, the "Fantasie" lamp, as it is called, has an "Argenta" white finish and an extended gold-anodised cap covering the upper 2in



Two of the new contemporary-shaped Philips "Fantasie" lamps

of the bulb. It is expected to have many applications, both for domestic and commercial purposes, i.e. hallways, lounges and kitchens, as well as shops and offices, and the price, including purchase tax, is 12s 6d.

### High Sensitivity Tube

The M.O. VALVE CO., LTD., Magnet House, Kingsway, London, W.C.2, a subsidiary of the G.E.C., has introduced a 3½in high sensitivity cathode ray tube with helical p.d.a. It is designed for use in compact oscilloscopes which need a flat-faced tube. Typical deflection sensitivities are

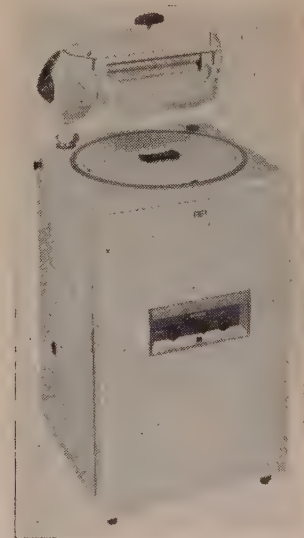
Sy—5.7 V/cm; Sx—30 V/cm. The tube is available with various screen phosphors and, depending on the phosphor used, the price is about £27.

### Sealed Transistors

A range of r.f. and switching transistors encapsulated in "Jedec 30" style cans with welded hermetic seals is announced by NEWMARKET TRANSISTORS, LTD., Exning Road, Newmarket (a Pye Group company). A full range of units is available with frequency cut-offs up to 30 Mc/s, usable betas up to 500 mA, voltage ratings up to 20 V, and dissipation up to 100 mW.

### Washing Machine

A new cabinet type "Parnall" washing machine with a dry clothes capacity of 6½ lb has been introduced by the ELECTRICAL DIVISION OF RADIATION, LTD., 255, North Circular Road, London, N.W.10. It is fitted with a reversible power wringer and an automatic emptying pump and all the controls are grouped on a central panel on the front of the cabinet. The machine is 33.7in high, allowing it to be stored beneath a draining board or work surface, and four swivelled wheels are fitted. When in position the wringer overhangs the sink, per-



"Parnall" washing machine with power wringer (Electrical Division of Radiation, Ltd.)

mitting clothes to be wrung directly into the sink and the wringer can then be swivelled between sink and draining board. Stowage for the wringer is provided in a compartment within the cabinet.

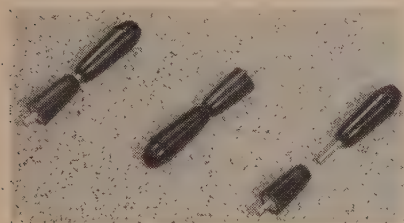
The washing machine is finished in cream or white stoved enamel and the



inner clothes tub is finished in vitreous enamel. The price of model EW.52 is £56 14s; the EW.52H model incorporates a 3 kW immersion type element and is priced at £63. A table top is available as an optional extra, price £2 15s. All prices include purchase tax.

### Wander Plug and Socket

A miniature wander plug and socket, particularly suited to printed circuit mounting, has been introduced by the radio components and special products department of the A.E.I. RADIO AND ELECTRONIC COMPONENTS DIVISION, 155, Charing Cross Road, London, W.C.2. The socket mounting pin diameter is 0.05in, conforming to the 0.1in module printed circuit technique, and the socket can be mounted on a 0.2in centre using the standard nominal 0.05in diameter mounting hole. The overall diameter of the socket body is 0.19in, pin length is  $\frac{7}{8}$ in and body length  $\frac{11}{32}$ in. The overall diameter of the plug is 0.19in, pin diameter 0.04in, pin length  $\frac{1}{4}$ in, and body length  $\frac{9}{16}$ in. Metal parts of the "Clix" plug



A.E.I. "Clix" plug and socket

and socket are brass, silver plated, and the insulation is nylon. Standard colours are red or black, but other colours can be supplied.

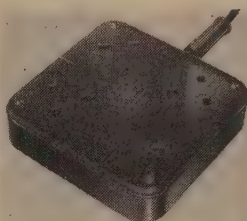
### Fluorescent Fittings

A new range of fluorescent lighting fittings is announced by the STEARN ELECTRIC CO., LTD., 31, Vauxhall Bridge Road, London, S.W.1. This new "Sheerline" range is based on a channel which is standard in section for both single and twin fittings and is also designed to take "Quick Start" control gear. All fittings have bi-pin lampholders and recessed loops are incorporated into the channel for chain suspension. Quick release cover plate fixings give easy access to the control gear and the chokes used are the resin-filled types. They are available in 8, 5, 4, 3 and 2ft sizes and can be supplied for mounting end to end. A special shoe connects fittings of any length and allows the installation of a continuous run of fittings to suit the requirements of individual positions. The fittings are manufactured for use on 230/250 V but they can also be supplied to special order tapped for

200/250 V at slight extra cost. An illustrated leaflet giving full details of sizes and prices is obtainable from the Stearn Electric Co., Ltd.

### Unbreakable Fused Socket-Outlet

A 4-way 13 A fused and shuttered socket-outlet made of unbreakable hard rubber or neoprene has been developed by the BRITISH CENTRAL ELECTRICAL CO., LTD., 6 and 8, Rosebery Avenue, London, E.C.1. Suitable



British Central Electrical Co.'s 4-way 13 A socket-outlet

for use as an extension lead in workshops, garages, etc., it will withstand the roughest treatment (the manufacturers claim that it can be run over by a heavy vehicle without suffering damage). All contacts are formed from continuous brass strip, mounted edgewise, in ring-main fashion and completely embedded in rubber (or neoprene). A 13 A fuse is fitted on the line side. There are no rivets or screws inside the unit which are not captive and enclosed in insulating material. An internal flex-locking device, in which the incoming wires are looped completely around a central insulated post, prevents cable pulling out or direct strain being applied to the terminals. The cable is protected at the point of entry by a flexible sleeve.

The unit measures 5in square by  $1\frac{5}{8}$ in deep and weighs  $1\frac{3}{4}$  lb. It is priced at £2 15s in rubber and £3 5s in neoprene.

### Liquid Level Controller

A compact conductivity operated liquid level controller known as the "Resistron" has been produced by THOMAS INDUSTRIAL AUTOMATION, LTD., Station Buildings, Altrincham, Cheshire. The equipment does not involve any moving parts in or on the container, and there is a full range of electrodes. The instrument is available as a fixed sensitivity device for high or low level operation, or fitted with a continuously variable sensitivity control and high/low change-over switch. It is intended for use with any conducting liquid providing the specific resistance does not exceed 50,000  $\Omega$ /cm cube. In conjunction with a high temperature electrode it can be used for boiler level control. The dust-

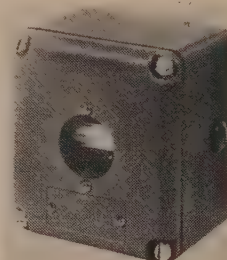
sealed relay has one normally open and one normally closed contact, rated at 5 A at 250 V a.c. Mains supplies of 110, 240 and 440 V, 40-60 c/s are covered by the standard version. The controller is available in a sheet steel or cast iron case fitted with two signal lights. The "fail-to-safety" facility is standard on all types. Two electrodes can be used with one controller to give high and low level alarm or control facilities. A special range of electrodes is available for all types of industrial application. Prices range from 14 gns.

### Laboratory Power Pack

A stabilised power supply unit has recently been produced by W. G. PYE & CO., LTD., Granta Works, Cambridge. A comprehensive range of voltages can be supplied and all d.c. outputs are fully stabilised against supply and load variations. The range includes d.c. outputs from 0 to 500 V, a fixed negative supply of -250 V and a variable negative supply of 0 to -250 V, all containing less than 0.003 V ripple. In addition, two separate a.c. supplies, each of 6.3 V at 5 A, are provided.

### Lighting Controller

An automatic lighting controller which is designed to switch on artificial light when natural lighting fails and switch it off again when natural lighting resumes, is now being manufactured and marketed by ELECTRICAL DISTRIBUTORS, 11, King Edward Buildings, Bury Old Road, Manchester, 8.



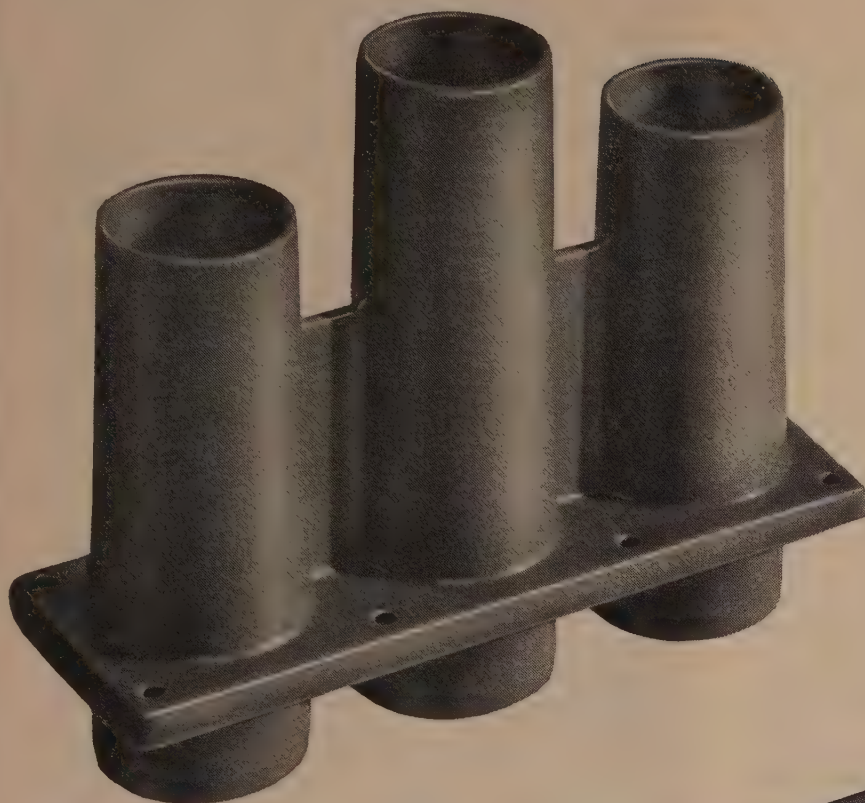
Electrical Distributors automatic lighting controller

The controller is adjustable to any level of daylight and is suitable for use with street lighting, all forms of commercial lighting and hospital lighting. The manufacturers claim that it can also be used for operating such equipment as shop blinds. The price is £7 7s.

### Decoration Lighting Sets

The price of the G.E.C. miniature Christmas tree fitted with a 20-bulb "Lilliput" decoration lighting set is £2 5s 6d and not £1 18s 10d as stated in last week's issue (p. 956). The price includes purchase tax.





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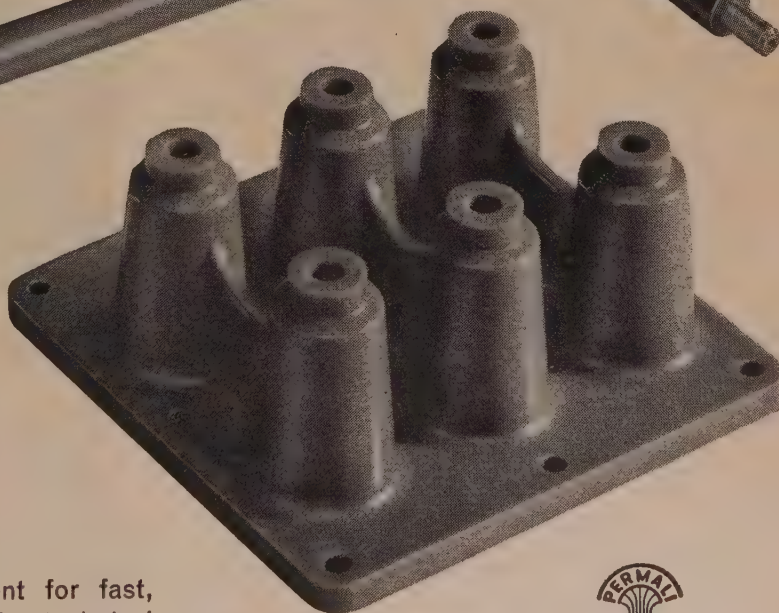
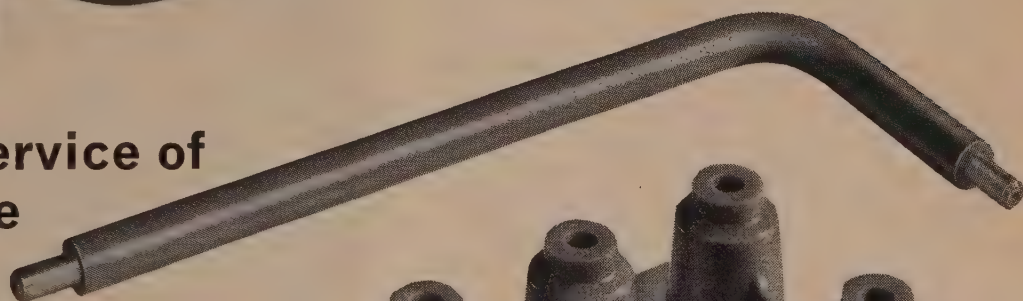
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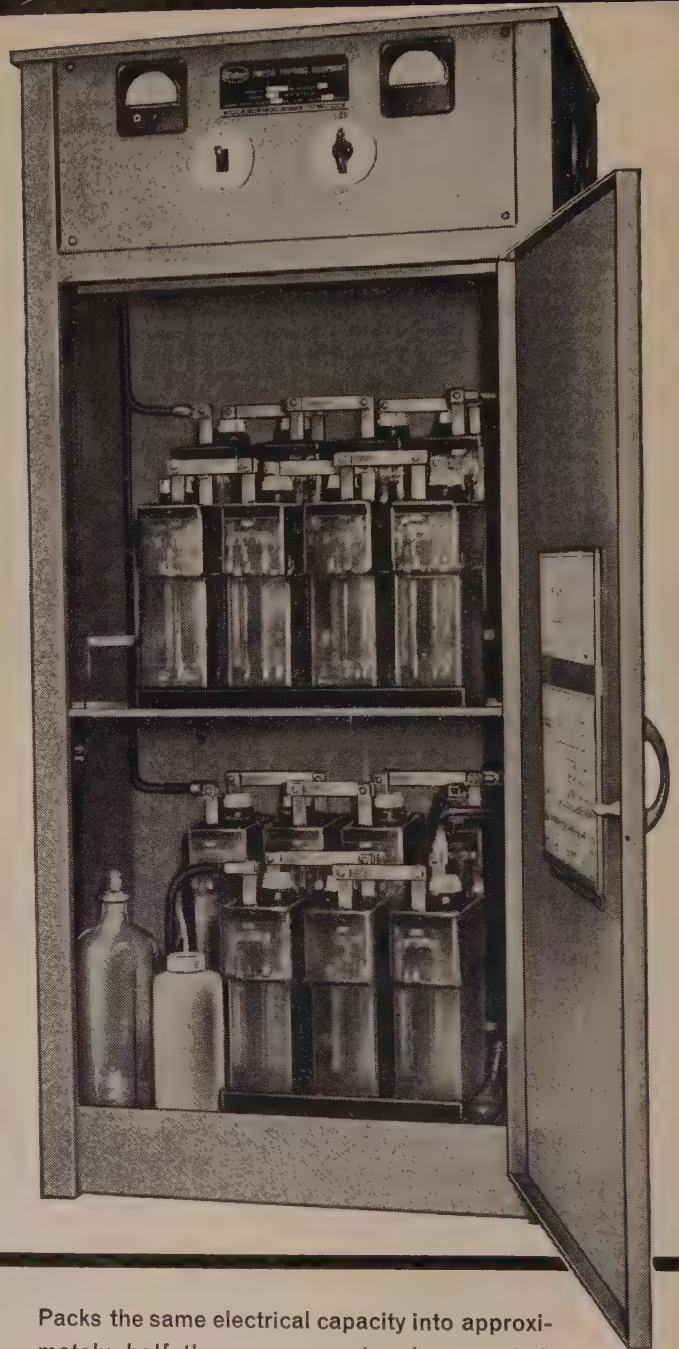


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# NEW TUDOR SELF-CONTAINED SWITCH-TRIPPING EQUIPMENT

The famous Tudor switch-tripping equipment is now being constructed to an improved design, and is being supplied with either the 10Ah B.S.S. cell or the new High Performance cell of 15 or 30 Ah capacity.\* The cubicles are now available either in folded sheet steel, or alternatively in a wooden cabinet fitted with a glass panelled door. The charger which is incorporated into the equipment is now suitable for both trickle and quick charging. The Tudor self-contained switch-tripping equipment is constantly at the ready in power plants, sub-stations, and many other places where loading is intermittent and an unfailing emergency supply is essential in case of temporary mains interruption. The equipment is easily maintained and throughout the years has proved unceasingly reliable.



\* The new Tudor  
High-  
Performance  
Cell



Packs the same electrical capacity into approximately half the space previously occupied. It maintains its remarkable length of life with complete reliability, and working efficiency has been increased.

Improved features of  
the Tudor 'Safetylyte'  
Emergency Lighting  
Equipment



Safetylyte equipments also are now being fitted with the new stationary cell. Charge and control cubicles are of improved design—the larger equipments being of folded sheet steel, and the smaller specially constructed for wall-mounting, employing automatic mercury relay in place of a contactor.

T175



## SELF-CONTAINED SWITCH-TRIPPING EQUIPMENT

THE D.P. BATTERY CO. LTD., manufacturers of Kathode and Tudor Batteries · BAKEWELL, DERBYSHIRE  
Telephone Bakewell 581-5



## NEW PATENTS

## Electrical Specifications Recently Published

*The numbers under which the specifications will be printed and abridged are given in parentheses. Copies of any specification (3s 6d each including postage) are obtainable from the Patent Office, 25, Southampton Buildings, London, W.C.2*

## 1950

7095. United Kingdom Atomic Energy Authority.—Fuel elements for thermal-fission nuclear reactors. 19th March, 1951. (854122.)

## 1955

32886. Pearson, J.—Electric fluorescent lamp lighting systems. 18th February, 1957. (854170.)

## 1956

5747. Electric & Musical Industries, Ltd.—Phase control circuits. 21st February, 1957. (853960.)

6394. Electric & Musical Industries, Ltd.—Correcting for transmission variations in colour television. 18th February, 1957. (853961.)

7829. British Thomson-Houston Co., Ltd.—Protecting systems for alternators. 11th March, 1957. (853963.)

8316. Reyrolle & Co., Ltd., A.—Electric protective arrangements. 8th March, 1957. (854312.)

8522. British Electrical & Allied Industries Research Association.—Electrical measuring apparatus. 19th March, 1957. (854366.)

11954. British Iron & Steel Research Association.—Electrical control by switching circuits. 10th April, 1957. (854462.)

12853. Siemens Edison Swan, Ltd.—Manufacture of semiconductor devices such as crystal triodes. 23rd April, 1957. (854070.)

15400. British Thomson-Houston Co., Ltd.—Motor control systems. 15th May, 1957. (854071.)

17247. Lyons, Ltd., C., and Lyons, W.—A.c. apparatus such as electric transformers. 2nd September, 1957. (854403.)

28846. English Electric Co., Ltd.—Pole-changing a.c. dynamo-electric machines. 18th September, 1957. (854018.)

29185. Southern United Telephone Cables, Ltd.—Electrical connecting devices. 24th September, 1957. (854019.)

29675. English Electric Co., Ltd.—Electric control systems. 26th September, 1957. (854215.)

35604. Holophane, Ltd.—Lighting appliances incorporating light controlling plates. 21st November, 1956. (854263.)

38518. Plessey Co., Ltd.—Potentiometers and variable resistors. 18th December, 1957. (853947.)

## 1957

661. Blaupunkt-Werke G.m.b.H.—Manufacture of printed circuits. 8th January, 1957. (853987.)

1020. Metropolitan-Vickers Electrical Co., Ltd.—Method for the encapsulation of electrical components. 8th November, 1957. (853941.)

1177. Faller, E., and Faller, H. (trading as Faller Geb.).—Miniature electric motor. 11th January, 1957. (854405.)

2063. Gulf Research & Development Co.—Method and apparatus for electrically positioning a movable element forming part of an analogue computer. 21st January, 1957. (854265.)

2252. Heinzig, E.—Electrical vaporiser for perfumes, deodorants or insecticides. 22nd January, 1957. (854266.)

2320. Moog Servo Controls, Inc.—Electrically controlled servo valve. 22nd January, 1957. (854287.)

5045. Lecadre, M. R. A.—Variable output voltage transformer. 14th February, 1957. (854288.)

5455. Etablissements Labinal.—Circuit-breakers. 18th February, 1957. (854484.)

6605. Pechiney Compagnie de Produits Chimiques et Electrometallurgiques.—Electrolytic cells. 27th February, 1957. (854173.)

6755. Ganz Kapcsolok es Keszulekek Gyara.—Apparatus for protecting electric motors with an electrically heated thermal-image device. 28th February, 1957. (854174.)

8890. Siemens-Schuckertwerke A.G.—Electric motor and pump assemblies. 18th March, 1957. (854165.)

9957. Automatic Telephone & Electric Co., Ltd.—Circuit arrangements employing magnetic cores. 19th February, 1958. (854105.)

10349. Standard Telephones & Cables, Ltd.—Manufacture of wound capacitors. 29th March, 1957. (854177.)

12766. Traverses en Beton Arme, Systeme Vagneux S.A., and Serafin, M. A.—Electrical insulation of sleepers of railway tracks. 18th April, 1957. (854290.)

13949. Brown, Boveri & Cie. A.G.—Water cooled nuclear reactors. 1st May, 1957. (854291.)

15273. Burke, M.—Heating units for electrically heated utensils. 14th May, 1958. (853949.)

21542. Philips Electrical Industries, Ltd.—Waveguide variable impedances. 8th July, 1957. (853952.)

27298. General Electric Co., Ltd.—Circuit arrangements for operating low pressure electric discharge lamps. 13th August, 1958. (854206.)

28690. British Telecommunications Research, Ltd.—Electrical connecting arrangements. 28th August, 1958. (853973.)

37680. Preston, G.—Fluorescent lighting fittings. 30th October, 1958. (854324.)

38036. Clements, W. W.—Impulse-type electromagnetically actuated devices. 6th December, 1957. (854030.)

38864. Fansteel Metallurgical Corporation.—Electrolytic capacitors. 13th December, 1957. (854414.)

39978. British Oxygen Co., Ltd.—Cooling systems for electrical apparatus. 15th December, 1958. (854224.)

## 1958

485. General Electric Co., Ltd.—Low-pressure mercury vapour electric discharge lamps. 6th January, 1959. (854388.)

1926. British Insulated Callender's (Submarine Cables), Ltd.—Electric cables. 19th January, 1959. (852370.)

2914. Bowler & Sidney, Ltd., and Bowler, H. P.—Electric protective devices. 29th January, 1959. (852372.)

4268. Kuhnke, H.—Electromagnets. 10th February, 1958. (854342.)

4401. Apter, M.—Bayonet-type electrical couplings with means for adjustably supporting lighting fittings. 6th April, 1959. (854225.)

5832. Electromagnets, Ltd.—Electromagnetically operated lifting magnets. 18th February, 1959. (852267.)

6344. National Cash Register Co.—Electro-optical switching unit. 27th February, 1958. (852702.)

6993. English Electric Co., Ltd.—Electrical protective relays using double rectifier bridge comparators. 2nd March, 1959. (852207.)

7110. Deutsche Edelstahlwerke A.G., Allgemeine Elektricitäts-G.m.b.H., and Trierer Walzwerk A.G.—Method of progressively fusing tin on electro-tin-plated metal strip by electrical heating. 5th March, 1958. (852378.)

7365. Harley, M. C.—Electric lamps. 6th February, 1959. (852549.)

12908. Metropolitan-Vickers Electrical Co., Ltd.—Reversing gear for unidirectional gas turbine drives. 24th March, 1959. (854000.)

12993. United Kingdom Atomic Energy Authority.—Gas cooled power reactors. 20th April, 1959. (852206.)

13054. Siemens Edison Swan, Ltd.—Production of hermetically sealed casings for semiconductor devices. 7th April, 1959. (852555.)

14649. Siemens & Halske A.G.—Electric circuit arrangements for use in installations for the transmission of information. 7th May, 1958. (854452.)

15138. Hawker Siddeley Nuclear Power Co., Ltd.—Nuclear reactors. 7th May, 1959. (854144.)

16005. General Electric Co., Ltd.—Liquid blast circuit-breakers. 8th May, 1959. (854148.)

16335. Harley, M. C.—Illumination systems. 5th May, 1959. (854453.)

16491. Soc. des Accumulateurs Fixes et de Traction.—Control devices for maintaining a rectified current at a constant voltage. 22nd May, 1958. (852303.)

17232. General Dynamics Corporation.—Nuclear reactors and fuel elements therefor. 29th May, 1958. (852877.)

17370. Siemens-Schuckertwerke A.G.—Production of semiconducting layers from semiconducting compounds. 30th May, 1958. (852598.)

17493. Magnetic Heating Corporation.—Tube or cable sheath welding. 2nd June, 1958. (854062.)

17703. General Electric Co., Ltd.—High pressure mercury vapour electric discharge lamps. 24th June, 1959. (852783.)

17830. Amp, Inc.—Electrical connections and methods of making these electrical connections. 4th June, 1958. (852563.)

17835. Weston, H. C.—Electric discharge lamps. 29th May, 1959. (852490.)

18418. Bulova Watch Co., Inc.—Electronically controlled timepieces. 9th June, 1958. (Addition to 840086.) (854196.)

18813. Bataafsche Petroleum Maatschappij N.V. de.—Processes for the preparation of carbon base materials and nuclear reactors including such materials. 12th June, 1958. (852600.)

19255. Telemecanique Electrique.—Electric cut-off switches having arc quenching arrangements. 16th June, 1958. (853162.)

19420. Soc. Steb.—Synchronous electric motors. 17th June, 1958. (852601.)

19808. Western Electric Co., Inc.—Current supply circuits. 20th June, 1958. (852128.)

19954. C. H. Parsons, Ltd., and Handley, G. B.—Electric switches and indicators therefor. 14th May, 1959. (852785.)

21396. Corning Glass Works.—Electroluminescent device and method. 3rd July, 1958. (854008.)

21971. Westinghouse Electric Corporation.—Coupling arrangements. 9th July, 1958. (854005.)

22185. English Electric Valve Co., Ltd.—Cathode-ray tubes. 25th March, 1959. (853078.)

22496. Neosid, Ltd.—Electrical components. 22nd June, 1959. (852789.)

23462. General Electric Co., Ltd.—Cathode-ray display devices. 20th July, 1959. (Cognate application 34702, 29th October, 1958. (853079.)

23523. Fulham Electrical Components, Ltd.—Electrical condensers for use with printed circuits. 14th May, 1959. (852790.)

(Continued on page 1018)



## NEW PATENTS (continued)

23852. Soc. d'Electronique et d'Automatisme.—Magnetic core switching devices. 24th July, 1958. (852791.)
26141. Licentia Patent-Verwaltungs G.m.b.H.—Electrically insulated conductor such as used for windings of dynamo-electric machines. 14th August, 1958. (852150.)
27175. United Kingdom Atomic Energy Authority.—Screening cans for electronic valves or transistors and the like. 25th August, 1959. (854296.)
28117. Triggs, W. W. (Picker X-ray Corporation Waite Manufacturing Division Inc.).—Multi-position rotary electric switch. 2nd September, 1958. (854481.)
28734. Soc. d'Electronique et d'Automatisme.—Saturable magnetic core circuits. 8th September, 1958. (852794.)
28840. Allmänna Svenska Elektriska A.B.—Insulated electrical conductor. 9th September, 1958. (852497.)
29004. Habib, R.—Device for eroding a metal part electrically. 10th September, 1958. (852924.)
30259. Allis-Chalmers Manufacturing Co.—Hermetically sealed pump and motor unit. 22nd September, 1958. (854024.)
30391. Bendix Corporation.—Shielded conductor element. 23rd September, 1958. (854117.)
34821. Westinghouse Electric Corporation.—Time delay circuits. 30th October, 1958. (852797.)
34848. Busch-Jaeger Durener Metallwerke A.G.—Electrical switch mountings. 30th October, 1958. (852668.)
34873. Siemens-Schuckertwerke A.G.—Electrical impulse current installation. 30th October, 1958. (852445.)
35433. Commissariat à l'Energie Atomique.—Devices for supporting at least the solid moderator of a nuclear reactor having vertical channels. 4th November, 1958. (853083.)
35601. Babcock & Wilcox Co.—Nuclear reactors. 5th November, 1958. (852177.)
35996. Smith, R. A.—Electric bulb holders. 10th November, 1958. (853159.)
36889. Philco Corporation.—Manufacture of electronic tubes and the like. 17th November, 1958. (854305.)
37553. General Electric Co.—Method and apparatus for the direct conversion of thermal to electrical energy. 21st November, 1958. (854036.)
37887. Western Electric Co., Inc.—Electrical circuit to indicate the difference between two binary code numbers. 25th November, 1958. (852388.)
38075. Brown, Boveri & Cie. A.G.—Device with a semiconductor rectifier. 26th November, 1958. (852798.)
39444. United States Atomic Energy Commission.—Preparation of high density UO<sub>2</sub>. 8th December, 1958. (852979.)
39794. Pittsburgh Plate Glass Co.—Transparent electroconductive article. 10th December, 1958. (852675.)
40326. Compagnie Générale de Télégraphie sans Fil.—Gain control devices for very high frequency signals. 15th December, 1958. (852799.)
40533. General Radio Co.—Electric system particularly for use with a bi-stable counter system. 16th December, 1958. (852391.)
40691. Westinghouse Electric Corporation.—Circuit-breakers. 17th December, 1958. (853047.)
41003. Western Electric Co., Inc.—Electromagnetic relays employing magnetic reed contacts. 19th December, 1958. (854044.)
- 1959
470. Allmänna Svenska Elektriska A.B.—Means for reducing the harmonic currents in a static converter plant. 6th January, 1959. (853371.)
716. Stokes & Sons, Ltd., J.—Insulators for electrifiable fencing. 8th January, 1959. (852801.)
733. Westinghouse Electric Corporation.—Gas-blast electric circuit interruptors. 8th January, 1959. (854254.)
1942. Maschinenfabrik Oerlikon.—Rectifier units. 19th January, 1959. (853373.)
2560. Electrolux A.B.—Washing machines. 23rd January, 1959. (852987.)
3713. Rott, H. G. (trading as Schoeller & Co., Elektrotechnische Fabrik).—Electrical igniter for cigars or cigarettes. 3rd February, 1959. (854394.)
3715. Lear, Inc.—Transistor voltage transfer switch. 3rd February, 1959. (852232.)
3896. Westinghouse Air Brake Co.—Transistor limiter circuit arrangements. 4th February, 1959. (853260.)
5106. Bendix-Westinghouse Automotive Air Brake Co.—Fluid responsive electric switch. 13th February, 1959. (852716.)
5126. United States Atomic Energy Commission.—Alloy members suitable for use as nuclear fuel elements and process for making same. 13th February, 1959. (854096.)
6616. Tapeswitch Corporation of America.—Electrical tape switches. 25th February, 1959. (854396.)
7844. General Electric Co.—Saturable current and potential transformer regulating system for a.c. generators. 6th March, 1959. (854028.)
8300. Beteiligungs- und Patentverwaltungs G.m.b.H., and Brown, Boveri & Cie.

- A.G.—Nuclear reactors. 10th March, 1959. (853051.)
8817. Compagnie Générale de Télégraphie sans Fil.—Magnetic separator devices for electron beams. 13th March, 1959. (854474.)
10106. Allmänna Svenska Elektriska A.B.—Arrangement in air-blast electric circuit-breakers. 24th March, 1959. (853243.)
12275. Telefunken G.m.b.H.—Instruments for measuring transistor cut-off frequency. 10th April, 1959. (852237.)
12808. Philips Electrical Industries, Ltd.—Glow discharge voltage stabiliser tubes. 15th April, 1959. (853092.)
14458. Telefonaktiebolaget L. M. Ericsson.—Amplifier arrangements for loud speaking telephone instruments. 28th April, 1959. (852276.)
14897. Western Electric Co., Inc.—Electric signal transmission systems and repeaters or amplifiers therefor. 1st May, 1959. (853361.)
15879. Standard Telephones & Cables, Ltd.—Pulse generator circuits. 8th May, 1959. (853362.)
16803. Vaughan, V. G.—Thermostatic electric circuit-breakers. 15th May, 1959. (853363.)
17139. Westinghouse Electric Corporation.—Silicon carbide semiconductor devices. 20th May, 1959. (853365.)
19697. Standard Telephones & Cables, Ltd.—Arrangements for controlling noise in electric communication systems. 9th June, 1959. (852863.)

## TRADE MARK APPLICATIONS

APPLICATIONS have been made for the registration of the following trade marks; objections against which may be entered up to 30th December:—

- Econolift.** No. 789,344. Class 7. Lifts.—Pickering, Ltd., Globe Elevator Works, Beaumont Street, Stockton-on-Tees.
- Discus.** No. 789,533. Class 7. Blowing machines, machine tools, electric motors (not for vehicles) and electric generators.—Watkins & Watson, Ltd., 17, White Lion Street, N.1.
- G Matic.** No. 795,756. Class 7. Washing machines and parts.—Bylock Electric, Ltd., 109, South Street, Enfield, Middlesex.
- Monomatic.** No. 796,644. Class 7. Machines and apparatus for laundering, airing, drying, washing, wringing, ironing and dishwashing, all for domestic use.—Ada (Halifax), Ltd., and Ajax Domestic Appliance Co., Ltd., both of West Mount Works, Johnson Street, Halifax.
- Tasc.** No. 797,178. Class 7. Variable speed transmission devices for use in driving machinery; speed governors for machines; magnetic and induction couplings; and electric motors (not for land vehicles).—Pye Electric, Ltd., 9, Upper Berkeley Street, London, W.1.
- Dualux.** No. 805,898. Class 7. Washing machines and centrifugal drying machines.—Stearn Electric Co., Ltd., 31, Vauxhall Bridge Road, London, S.W.1.
- Dreamline.** No. 806,549. Class 7. Mixing, washing and drying machines, all electrically operated.—Domestic Electric Rentals, Ltd., Television House, 3, The Green, Twickenham.
- Invalift.** No. 807,850. Class 7. Apparatus for lifting and carrying invalids.—Electrical Production (Leeds), Ltd., Hope Road, Mabgate, Leeds.
- Bailey Meters** (in circular design). No. 777,630. Class 9. Apparatus, automatically operated by changes in physical variables, for giving visible or audible warning of failure in industrial operations and for automatically controlling such operations; voltage regulators; and switches for the remote control of electrical devices.—Bailey Meters & Controls, Ltd., Purley Way, Croydon.

**CA** (on shield). No. 791,189. Class 9. Electronic instruments.—Communications (Air), Ltd., Tulyar House, Half Moon Street, Bagshot, Surrey.

**Soreng** (design). No. 795,632. Class 9. Electrical apparatus and instruments; time delay action contrivances; solenoids, etc.—Control Company of America, Schiller Park, Illinois. Address for service: Mathisen & Macara, 97, Jermyn Street, St. James's, S.W.1.

**Memopark.** No. 798,031. Class 9. Time switches, indicating gauges, hour recording meters, electricity meters, animal fences with electric charging means, electrical apparatus for automatically controlling the lighting of pedestrian crossings, coin or counter-free apparatus, etc.—Venner, Ltd., Kingston By-Pass, New Malden, Surrey.

**Dustract.** No. 801,367. Class 9. Domestic electric vacuum cleaners.—Esge Gschwend & Spingler K.G. Elektromotoren-und Apparatebau, Württemberg, Germany. Address for service: H. D. Fitzpatrick & Co., 94, Hope Street, Glasgow, C.2.

**BK** (on shield). No. 802,360. Class 9. Electronic instruments.—B. & K. Laboratories, Ltd., 4, Tilney Street, Park Lane, London, W.1.

**Storno** and **Stornophone.** Nos. 805,361/2. **Storno** (design). No. 805,632. Class 9. Telecommunication instruments and radio apparatus.—Det Store Nordiske Telegraf-Selskab (Aktieselskab), Copenhagen. Address for service: Thiemann, Son & Co., Prestige House, 14-18, Holborn, London, E.C.1.

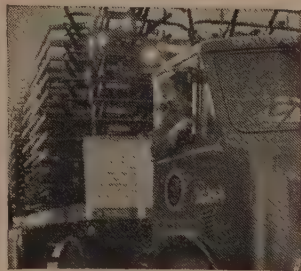
**Debutante.** No. 809,495. Class 9. Radio receiving sets, television sets, etc.—Decca Record Co., Ltd., 9, Albert Embankment, London, S.E.11.

**Certor.** No. 808,262. Class 10. Electric blankets.—Macdonald & Son, Ltd., Portland Mill, Ashton-under-Lyne.

**Faema.** No. 802,273 and 802,278. Class 11. Hairdrying appliances (not machines); ventilating apparatus and installations; ventilating fans for tables; electrically and gas heated apparatus for making coffee, etc.—E. Valente, Milan. Address for service: Wilson, Gun & Ellis, 57, Market Street, Manchester.



# B.R.S. run an assembly line 100 miles long



WELLINGTON  
The chassis starts life here



LIVERPOOL  
Bonnets come from Merseyside



BIRMINGHAM  
From where the boots and rear wings come

## Conveyor-belt smoothness speeds the Herald

Like every car manufacturer, Standard/Triumph depends on sub-assemblies arriving from other factories. With clock-work precision. Every day, British Road Services lorries shuttle between Wellington, Liverpool and Birmingham and the main Coventry works, feeding the Triumph Herald assembly lines.

Every day, the 'bits and pieces' for one day's production must be on hand. No more (there's no space for storage) and certainly no less! A bottleneck could be a nightmare. The goods must arrive, and the empty pallets must get back so that the next day's output can be loaded. It's rather like filling a bath, with no plug, from four taps so that there's always exactly the same amount of water in it. **It takes British Road Services to do it.**



CANLEY WORKS,  
COVENTRY. Where  
components become  
cars. B.R.S. run a  
shuttle service be-  
tween Standard/  
Triumph Coventry  
factories.

*Plastic covers protect the hoods of Herald Convertibles on the production line. Photograph by kind permission of Standard/Triumph Sales Ltd.*

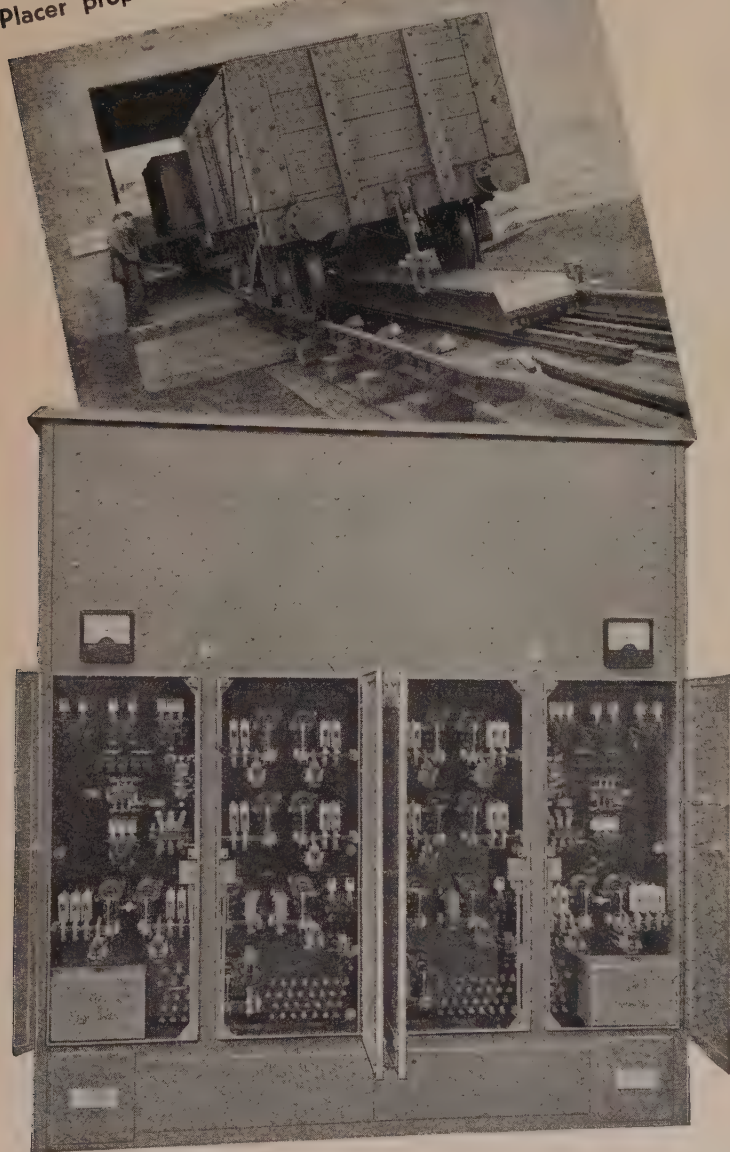
# To get things moving — get B.R.S.

—you'll find them in the 'phone book



# — and another 'MICRO-sen'

Denbeath Central Coal Washery NCB  
Placer propelling wagon on to tippler



THIS time in conjunction with E.M.B.

Equipment it is used to control the haulage mechanism supplied by Mitchell Engineering Ltd., of Peterborough, for placing wagons on to the tippler at Denbeath Central Coal Washery N.C.B.

We understand that the whole equipment is working very satisfactorily and has become a showpiece for engineers from other areas.

The 'MICRO-sen' gives an accurate speed control for any standard A.C. slip-ring motor.

Speeds can be obtained ranging from 10% to full synchronous speed.

Other 'MICRO-sen' applications include nuclear power station cranes, skip hoists, coke oven plants, guided missile and rocket installations.



With acknowledgements to—  
MITCHELL ENGINEERING LTD  
THE DAYLITE ELECTRICAL Co LTD  
THE NATIONAL COAL BOARD

# E.M.B. Co Ltd

WEST BROMWICH  
ENGLAND



# NEXT WEEK'S EVENTS

Organisers of electrical functions are advised to make use of the "Electrical Review" clearing house, Room 221, Dorset House, Stamford Street, London, S.E.1, to ascertain that proposed dates for their functions do not clash with others already arranged.

## MONDAY, 12th DECEMBER

**Birmingham.**—Grand Hotel, 5.30 p.m. Birmingham Electric Club. "Subscriber Trunk Dialling," by H. E. Francis.

**Bournemouth.**—Grand Hotel, Firvale Road, 8 p.m. A.S.E.E. Bournemouth and District Branch. "Electricity in Agriculture," by C. W. Gould.

**Bristol.**—Engineering Laboratories, University Walk, 6 p.m. I.E.E. Western Centre. "Engineering Education at the Technical Universities in Western Germany," by D. B. Welbourn.

**Leeds.**—Hotel Metropole, King Street, 7 p.m. Institution of Production Engineers, East and West Ridings Region. "Statistics as an aid to Production Engineers," by C. Lovell.

**London.**—Savoy Place, W.C.2, 5.30 p.m. I.E.E. Electronics and Communications Section. "Topology Concepts in Network Theory," by P. R. Bryant.

White Hall Hotel, Bloomsbury Square, W.C.1, 7.15 p.m. A.S.E.E. Central London Branch. Discussion.

**Manchester.**—Queen's Hotel, 6.30 p.m. Engineers' Guild, North Western Branch. "The 1960 Survey of Salaries."

**Newcastle-upon-Tyne.**—Neville Hall, Westgate Road, 6.15 p.m. I.E.E. North Eastern Centre. "Street Lighting," by W. R. Stevens, and "A Survey of Street Lighting and its Future," by W. R. Stevens and H. M. Ferguson.

**Nottingham.**—W. J. Furze & Co., Ltd., 29, Traffic Street, 6.15 p.m. I.E.S. Leicester Centre. "Stage Lighting," by E. E. Faraday.

**Sheffield.**—Grand Hotel, 7.15 p.m. Institution of Production Engineers, East and West Ridings Region. "Welding of Railway Rolling Stock," by G. Walton.

**Stone.**—Duncan Hall, 7 p.m. I.E.E. North Staffordshire Sub-Centre. "Recent Developments in Colour Television," by I. J. P. James.

**Wembley.**—Century Hotel, 8.15 p.m. A.S.E.E. North West London Branch. "Infra-Red and its Applications," by E. Gradwell.

## TUESDAY, 13th DECEMBER

**Aldershot.**—Queen's Hotel, High Street, 8 p.m. A.S.E.E. Aldershot and Districts Branch. "Television," by A. W. Binnie.

**Canterbury.**—County Hotel, 8 p.m. A.S.E.E. East Kent Branch. Social evening.

**Chelmsford.**—White Hart Hotel, Tindal Street, 7.30 p.m. A.S.E.E. Chelmsford Centre. Ladies' invitation evening.

**Chester.**—Westminster Hotel, City Road, 7.45 p.m. A.S.E.E. Chester and District Branch. "Electrical Equipment used in the Refrigeration Industry," by A. Etherington.

**Edinburgh.**—Carlton Hotel, 7 p.m. I.E.E. South East Scotland Sub-Centre. "Energy Resources of Scotland," by J. Henderson.

**Leeds.**—Leeds and County Conservative Club, South Parade, 7 p.m. I.E.E. North Midland Graduate and Student Section. "Distribution Design in Urban Areas," by W. K. Billington.

**London.**—Connaught Rooms, W.C.2, 12.30 for 1 p.m. Electrical Industries Club. Christmas luncheon. Speaker, Norman Collins.

Institution Building, Savoy Place, W.C.2, 6.30 p.m. I.E.E. London Graduate and Student Section. "Electrical Engineering in the Naval Service," by Sir Hamish MacLaren.

Criterion Restaurant, Piccadilly Circus, 10.30 a.m. Combustion Engineering Association. Southern Region. "Standards of Boiler Instrumentation," by R. P. Braby.

Federation of British Industries, Tothill Street, S.W.1, 6 p.m. Illuminating Engineering Society. "Visual Problems on Motorways," by J. M. Waldram.

Memorial Building, 76, Mark Lane, E.C.3, 5.30 p.m. Institute of Marine Engineers. "Details and Operating Data of Recent A.C. Installations," by A. N. Savage.

**Manchester.**—Engineers' Club, Albert Square, 7 p.m. I.E.E. North Western Centre. "Pharmacology of the Mind," by A. D. MacDonald.

**Newcastle-upon-Tyne.**—I.E.E. North Eastern Graduate and Student Section. Visit to King's College Electrical Engineering Department.

**Oxford.**—Employment Exchange, 8 p.m. A.S.E.E. Oxford and Districts Branch. "The Testing of an Electrical Installation," by T. Howell.

**Portsmouth.**—Committee Rooms, Ministry of Labour Offices, Lake Road, 7.30 p.m. A.S.E.E. Portsmouth and District Branch. "Corrosion in Action."

**Swansea.**—Brangwyn Hall, 6 p.m. I.E.E. West Wales Sub-Centre. Faraday Lecture. "Transistors," by L. J. Davies.

**Workington.**—College of Further Education, 7 p.m. I.E.E. North Eastern Centre. "The Transmission of News Film over the Transatlantic Cable," by C. B. Wood.

**York.**—Royal Station Hotel, 7.30 p.m. A.S.E.E. York Branch. "The Protection of Electrical Installations," by J. A. Robbins.

## WEDNESDAY, 14th DECEMBER

**Aberdeen.**—Caledonian Hotel, Engineers' Guild, Aberdeen Centre. Luncheon meeting. Speaker, I. Thomson.

**Birmingham.**—Birmingham Exchange and Engineering Centre, Stephenson Place, 7.30 p.m. A.S.E.E. Birmingham Branch. "Plant Engineering in the Food Industry," by L. A. Hand.

**Exeter.**—Exeter University, Washington Singer Laboratories, 3 p.m. I.E.E. South Western Sub-Centre. "The Application of Irradiation in Industry," by M. C. Crowley-Milling.

**London.**—Savoy Place, W.C.2, 5.30 p.m. I.E.E. Supply Section. "A Basis for Short-Circuit Ratings for Paper-Insulated Cables up to 11 kV," by L. Gosland, and "Short-Circuit Ratings for Mains Cables," by G. S. Buckingham.

1, Birdcage Walk, Westminster, S.W.1, 6 p.m. Institution of Mechanical Engineers. James Clayton Lecture. "Machine Tool Research, Design and Utilisation," by Dr. D. F. Galloway.

45, Great Peter Street, Westminster, S.W.1, 7 p.m. Women's Engineering Society, London Branch. "Power Transmission by Submarine Cable," by Capt. F. Potts.

**Luton.**—Luton College of Technology, Park Square, 8.15 p.m. A.S.E.E. Luton Branch. "The National Inspection Council," by H. C. Breeze.

**Newcastle-upon-Tyne.**—Bolbec Hall, 7 p.m. North East Coast Institution of Engineers and Shipbuilders. "Welding and Prefabrication in Shipbuilding," by D. R. Patterson.

**Northampton.**—Room B16, College of Technology, 7.15 p.m. Northampton and District Electrical Association. "Railway Electrification," by K. R. Brown.

**Nottingham.**—Sherwood Room, County Hotel, Theatre Square, 7 p.m. Institution of Plant Engineers, East Midlands Branch. "The Application of New Materials to Plant Engineering," by J. Leyland.

Nottingham Mechanics' Institution, Trinity Square, 7.30 p.m. A.S.E.E. Nottingham Branch. Annual films evening.

**Rugby.**—College of Engineering Technology, 6.30 p.m. I.E.E. Rugby Sub-Centre. "Some Considerations in the Application of Power Rectifiers and Convertors," by J. P. McBreen.

**Sheffield.**—The University, Mappin Street, 6.30 p.m. I.E.E. North Midland Centre,

Sheffield Sub-Centre. "The Determination of the Electrical Characteristics of an Arc Furnace," by J. Ravenscroft.

Grand Hotel, 6.30 p.m. I.E.S. Sheffield Centre. "Chance and Vision," by D. L. Smare.

**Wolverhampton.**—College of Technology, Wulfruna Street, 6.15 p.m. British Institution of Radio Engineers, West Midlands Section. Technical films.

Chamber of Commerce, District Bank Chambers, Lichfield Street, 7.45 p.m. A.S.E.E. Wolverhampton and District Branch. "Modern Light Sources and their Application," by W. A. R. Stoyles.

## THURSDAY, 15th DECEMBER

**Chelmsford.**—Crompton's Social Hall, 7.30 p.m. Chelmsford Engineering Society. "Genealogy of Remote Control," by A. L. Hancock.

**Croydon.**—Greyhound Hotel, High Street, 8 p.m. A.S.E.E. South London Branch. "Management and Utilisation."

**London.**—1, Birdcage Walk, Westminster, S.W.1, 6 p.m. Institution of Mechanical Engineers. Nuclear Energy Group Discussion. "The Impact of a Three-Fuel Economy."

Savoy Place, W.C.2, 6 p.m. I.E.E. Education Discussion Circle. "How to Pass Examinations, or the Psychology of Study," to be opened by C. A. Mace.

76, Mark Lane, E.C.3, 2.30 p.m. Diesel Engineers' and Users' Association. "Report on Diesel Engine Working Costs and Performance, 1959/60."

**Reading.**—George Hotel, King Street, 7.30 p.m. Institution of Production Engineers, Southern Region. "Electronic Data Processing Allied to Production Engineering," by F. W. Purchall.

**Southampton.**—Polygon Hotel, 7 for 7.30 p.m. I.E.E. Southern Centre. Annual dinner and dance.

## FRIDAY, 16th DECEMBER

**Birmingham.**—Lecture Theatre, New College of Technology, Gosta Green, 7 p.m. Institution of Electronics. Lecture on "The Physics and General Applications of Semiconductor Devices."

Regent House, St. Philip's Place, Colmore Row, 6 p.m. I.E.S. Birmingham Centre. "Stage Lighting," by F. P. Benthall, and visit to Belgrade Theatre, Coventry.

**Chester.**—Town Hall, 6.30 p.m. I.E.E. Mersey and North Wales Centre. "The Logomotor—a Cylindrical Brushless Variable-Speed Induction Motor," by Professor F. C. Williams, Dr. E. R. Laithwaite, J. F. Eastham and L. S. Piggott.

**Hanley.**—Grand Hotel, 7.30 p.m. A.S.E.E. Stoke and Crewe Branch. "The Factories Act and the Electrical Engineer," by G. L. Leighton.

**Leeds.**—Parkway Hotel. A.S.E.E. Leeds Branch. Annual dinner and dance.

**London.**—Grosvenor House, Park Lane, W.1. Institute of Marine Engineers. Annual conversazione.

Pepys House, 14, Rochester Row, Westminster, S.W.1, 7.30 p.m. Junior Institution of Engineers. Inaugural meeting, presentation of awards, and presidential address by E. S. Sellers.

**Newcastle-upon-Tyne.**—Mining Institute, 6.15 p.m. North East Coast Institution of Engineers and Shipbuilders. "The Institution," by the Secretary.

**Sheffield.**—University Engineering Lecture Theatre, St. George's Square, 7 p.m. Institution of Electronics. Film show.

## SATURDAY, 17th DECEMBER

**London.**—Connaught Rooms, W.C.2, 6.30 p.m. Association of Supervising Electrical Engineers. Ladies' gala night.



# CONTRACT INFORMATION

## Accepted Tenders and Prospective Electrical Work

### CONTRACTS OPEN

Where "Contracts Open" are advertised in our "Official Notices" section the date of the issue is given in parentheses

**Australia.**—Southern Electric Authority of Queensland. 18th January. 11 kV, 250 MVA indoor switchgear. (E.S.B. 30781/60.)\*

**Victorian Railways, Melbourne.** 15th February. Twelve-channel carrier telephone system. (E.S.B. 31454/60.)\*

**Bath.**—City Council. 7th January. Illuminated bollards and lighting equipment, low voltage cables, discharge lamps, tungsten lamps and electrical fittings, lanterns for street lighting, control gear and capacitors and time switches for one year from 1st April, 1961. City and waterworks engineer, Guildhall, Bath.

**Edinburgh.**—North of Scotland Hydro-Electric Board. 132 kV transmission line spur to Burghmuir, Perth. (See this issue.)

**Formosa.**—Central Trust of China. 26th December. Diesel-electric generators. (E.S.B. 31319/60/I.C.A.)\* 15 kVA transformer. (E.S.B. 31312/60/I.C.A.)\* Telephone equipment. (E.S.B. 31304/60/I.C.A.)\* Electric travelling crane. (E.S.B. 31355/60/I.C.A.)\*

**Ilford.**—Borough Council. 2nd January. Supply of electric cable (Form No. 7) and g.l.s. electric lamps (Form No. 16) for one year to 31st March, 1962. Borough engineer, Ilford Town Hall.

**India.**—Andhra Pradesh State Electricity Board. 4th January. Thirty-nine power transformers, 1,500-3,000 kVA. (E.S.B. 30879/60.)\*

**Madras State Electricity Board.** 2nd February. Insulators and accessories for 230, 110 and 66 kV transmission lines. (E.S.B. 30880/60.)\*

**India Store Department.** 7th February. Boiler feed pumps for Chandrapura power station. (E.S.B. 31411/60/D.L.F.)\*

**Italy.**—Ministero Difesa-Aeronautica-Ispettorato. Six multi-channel v.h.f. transceivers (contract 9938); power supply units for RP.32 receivers (contract 9940) and three multi-channel u.h.f. transceivers (contract 9937). Applications to tender by 20th December. (G.D. 732/60 (70 and 72).)

**N.A.T.O. Infrastructure contract.** 20th December. Fifteen mobile radio telephone equipments. (G.D. 732/60(68).)\*

**London.**—Bermondsey Borough Council. 16th January. Supply of electric lamps for one year from 1st April, 1961. Town clerk, Municipal Offices, Spa Road, S.E.16.

**Malaya.**—Central Electricity Board. 27th January. Boilers and auxiliary plant for Johore Bahru power station. (E.S.B. 31599/60.)\*

**Manchester.**—City Council. 3rd January. Road and car park lighting at Manchester Airport. (See this issue.)

**Pakistan.**—Directorate General of Supply and Development, Karachi. 12th January. Public lighting fittings. (E.S.B. 31352/60/I.C.A.)\*

**Post and Telegraph Directorate-General, Karachi.** 9th January. Cabinets and cable terminal boxes. (E.S.B. 31450/60.)\*

**Eastern Bengal Railways, Chittagong.** 20th December. Electric hoists. (E.S.B. 31378, 31382, 31385 and 31388/60.)\* 21st December. Motor generator and voltage regulator set. (E.S.B. 31381/60.)\*

**Rhodesia and Nyasaland.**—Umtali Municipality. 22nd February. Load control equipment. (E.S.B. 30812/60.)\*

**Romford.**—Borough Council. 2nd January. Sodium street lighting equipment. (See this issue.)

**South Africa.**—Union Tender Board, Pretoria. 21st December. Two 750 kVA diesel generating sets. (E.S.B. 30792/60.)\*

**Sudan.**—Stores Department, Sudan Railways. 11th January. Workshop distribution switch and fuse board. (E.S.B. 30848/60.)\*

**Wanstead and Woodford.**—Borough Council. 6th January. Supply of electric lamps (Form No. 13) for one year. Borough engineer, Municipal Offices, Woodford, E.18.

**Yugoslavia.**—31st December. Electrical and scientific equipment. (E.S.B. 31358/60/I.C.A.)\*

### ORDERS PLACED

**London.**—L.C.C. Supply and fixing of electric water heaters in dwellings, Becontree estate, Essex (£19,905); Downham estate, Lewisham (£8,428) and Hanwell estate, Ealing (£9,295).—F. J. Baynes & Co.

**Walton-on-Thames.**—South West Metropolitan Regional Hospital Board. Installation of electrical services in main building in connection with the conversion of the Metropolitan Convalescent Home into a geriatric hospital (£12,002).—Buchanan & Curwen.

### WORK IN PROSPECT

*Particulars of new works and building schemes for the use of electrical installation contractors and traders. Publication in this section is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors*

**Aberavon.**—Restaurant and swimming pool (£250,000); borough engineer, Municipal Buildings.

**Abingdon.**—Flats (35), Vineyard; Dennis Page & Partners, architects, 28, Beaumont Street, Oxford.

**Accrington.**—Works, Marlborough Road; Finch Watson, Ltd., Ramsbottom Street.

Market (175,000); A. Monk & Co., Ltd., Padgate, Warrington.

**Banstead (Surrey).**—Houses (243), Tadworth; F. L. Shaw, clerk, Council House, Brighton Road.

**Bath.**—Second instalment of new technical college; Frederick Gibberd, architect, 19, The Rows, Stone Cross, Harlow, Essex.

**Bedlington.**—Three-storey blocks of flats and maisonnettes at Choppington (£273,000); U.D.C. surveyor.

**Birkenhead.**—Public hall, swimming bath, club rooms, pavilion and clinics, Woodchurch estate; borough architect, 3, Conway Street.

**Birmingham.**—High school for girls, Westbourne Gardens, Edgbaston; Holland W. Hobbiss, architect, 36, Waterloo Street, Birmingham.

**Bishop Auckland.**—Nurses' preliminary school at Bishop Auckland General Hospital; R. W. Gregory & Partners, consulting engineers, Pilgrim House, Pilgrim Street, Newcastle-on-Tyne.

Office block for Wilson's Foundry & Engineering Co.; M. C. Robson & Son,

architects, Station Chambers, Bishop Auckland.

**Bletchley.**—Grammar-technical school; county architect, County Hall, Aylesbury.

**Brecon.**—Extensions to Brecon Girls' Grammar Technical School (£94,000); county architect, Rhyd Offices, Brecon.

**Chichester.**—Supermarket, East Street; Tesco Stores, Ltd., Delamere Road, Cheshunt.

**Cornwall.**—Women's and catering block at Cornwall Technical College; county architect, County Offices, Truro.

**Croydon.**—Reconstruction of departmental stores, Crown Hill site; British Home Stores, Ltd., 129-139, Marylebone Road, London, N.W.1.

Flats (42), Pampisford Road; Wellswood Estates, Ltd., 2, Sloane Gardens, London, S.W.1.

Old people's home at Monks Hill estate (£65,000); borough engineer, Town Hall.

**Cuckfield.**—Houses (60), Ashground Wood, Haywards Heath; surveyor, Council Offices, Oaklands, Haywards Heath, Sussex.

**Derbyshire.**—New fire stations at Alfreton, Chapel-en-le-Frith, Ilkeston and Melbourne; county architect, St. Mary's Gate, Derby.

**Doncaster.**—Blocks of flatlets for old people, Askern and Kirk Sandall (£63,558); R.D.C. surveyor.

**Eastbourne.**—Congress theatre; Bryan and Norman Westwood & Partners, architects, 21, Suffolk Street, London, S.W.1.

**Gateshead.**—Development of housing land at Chowdene Hall Farm (500 houses); Hadden & Hillman, Ltd., Heaton Road, Newcastle.

Maisonnettes (48), Wallace Village, and old people's houses (30), Yetholm Road; G. F. Winters, borough engineer.

**Greenford (Middlex.).**—Five-storey block of shops and offices, Ruislip Road East; Griggs & Son, Ltd., 56, Victoria Street, S.W.1.

**Leeds.**—Multi-storey blocks of flats, Camp Road estate; city architect.

**London.**—Offices, Gauden Road, Clapham; Bridge Walker, Ltd., 91, Effra Road, S.W.2.

Flats and maisonnettes (169), Fleet Road estate, Hampstead; borough architect.

**Lowestoft.**—Works, Wilde's Street; Birds Eye Foods, Ltd., Hesketh House, Portman Square, London, W.1.

**Luton.**—Central bus station, including block of shops and offices, Bridge Street, etc.; director of housing, Town Hall.

**Oxford.**—Works extensions; Hunt & Broadhurst, Ltd., Ideal Works, Botley Road.

**Poole.**—Grammar school for boys, Canford Heath (£280,000); county architect, County Hall, Dorchester.

**Redditch.**—Works extensions; Super Oil Seals & Gaskets, Ltd., Studley Road.

**Redruth.**—Junior and adult mental health training centre and psychiatric old people's home; county architect, Truro.

**Sheffield.**—Works, Woodside Lane and Birley Street; Stanley Works (Great Britain), Ltd., Rutland Street.

**Spennymoor (Co. Durham).**—Offices for the No. 4 Area of the Durham Coal Board (£100,000); N.C.B. Architects' Department, 24, The Side, Newcastle-on-Tyne.

**Tipton.**—Offices; Wilfred Robbins, Ltd., Great Bridge Works.

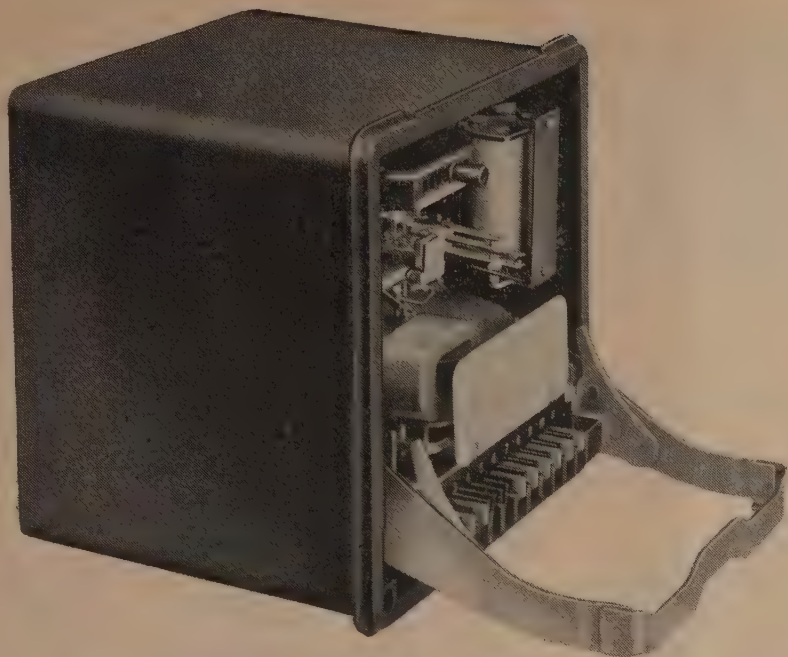
**West Bromwich.**—Maisonnettes (130), Witton Lane estate; borough surveyor.

Process buildings; Robinson Bros., Ltd., Phoenix Street.

**Wolverton (Bucks.).**—Blocks of flats (estimated cost £250,000); U.D.C. surveyor.

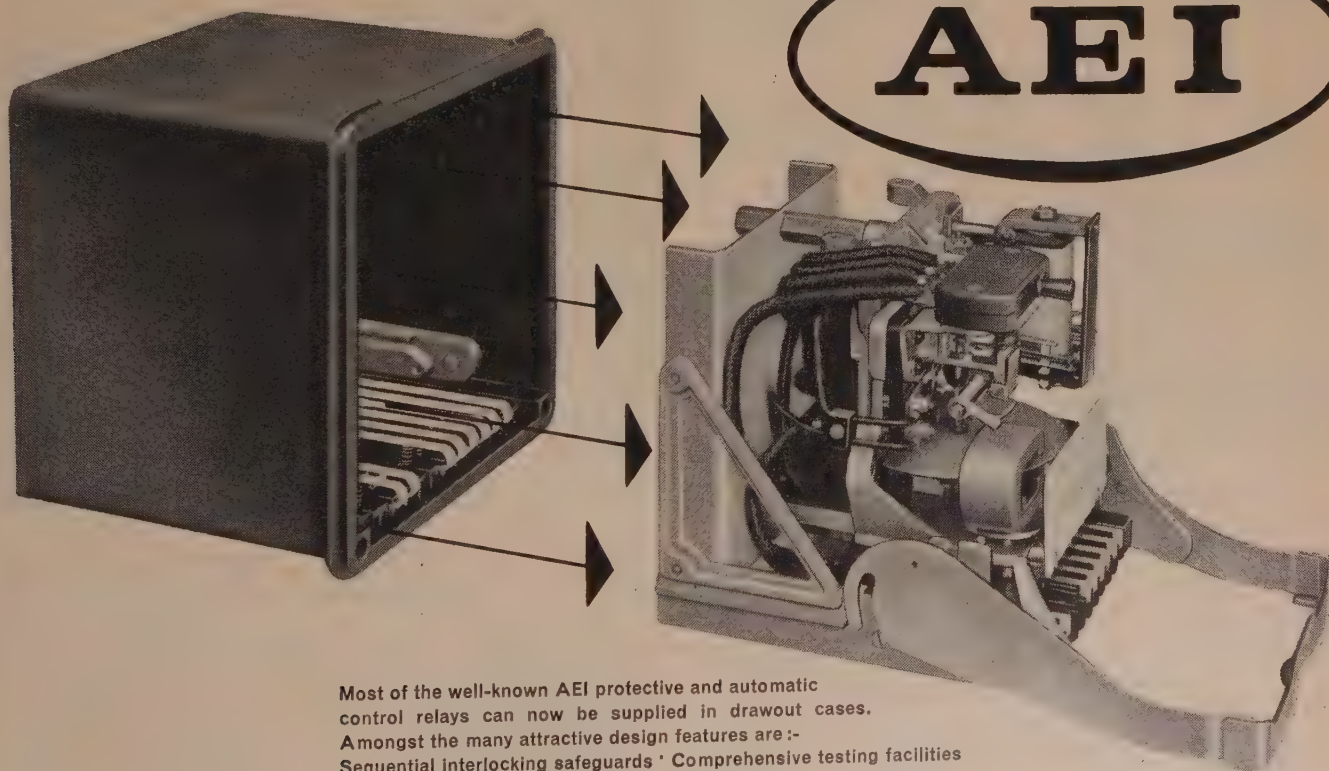
\* This information is extracted from the Board of Trade Export Service Bulletin. Inquiries should be addressed to the Board of Trade, Export Services Branch, Lacon House, Theobald's Road, London, W.C.2 (Telephone: Chancery 4411, Ext. 738), quoting the reference given.





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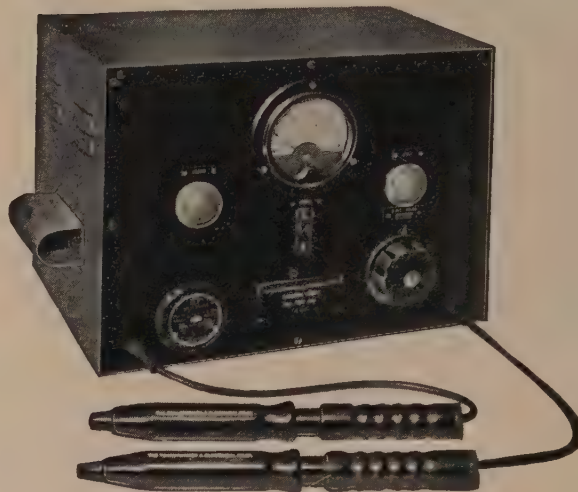
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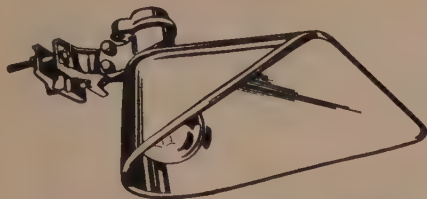
London Office: 47 WHITEHALL, S.W.1  
Telephone: Whitehall 6058





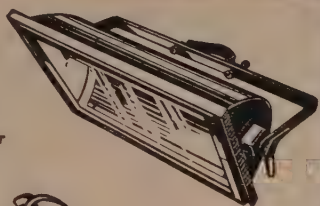
## List No. 890

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## List No. 940

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Lantern for wall or  
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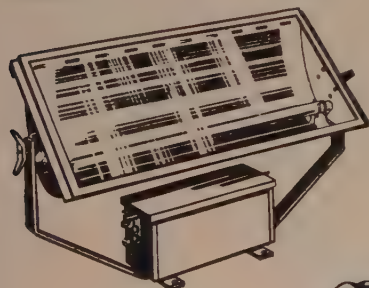


## List No. 775

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## List No. 920

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## List No. 556

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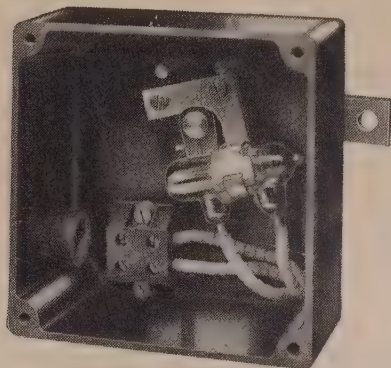
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UNITS



MERCURY SWITCH  
RELAYS



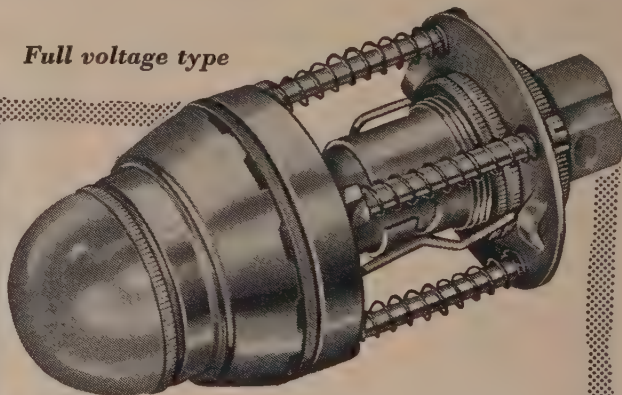
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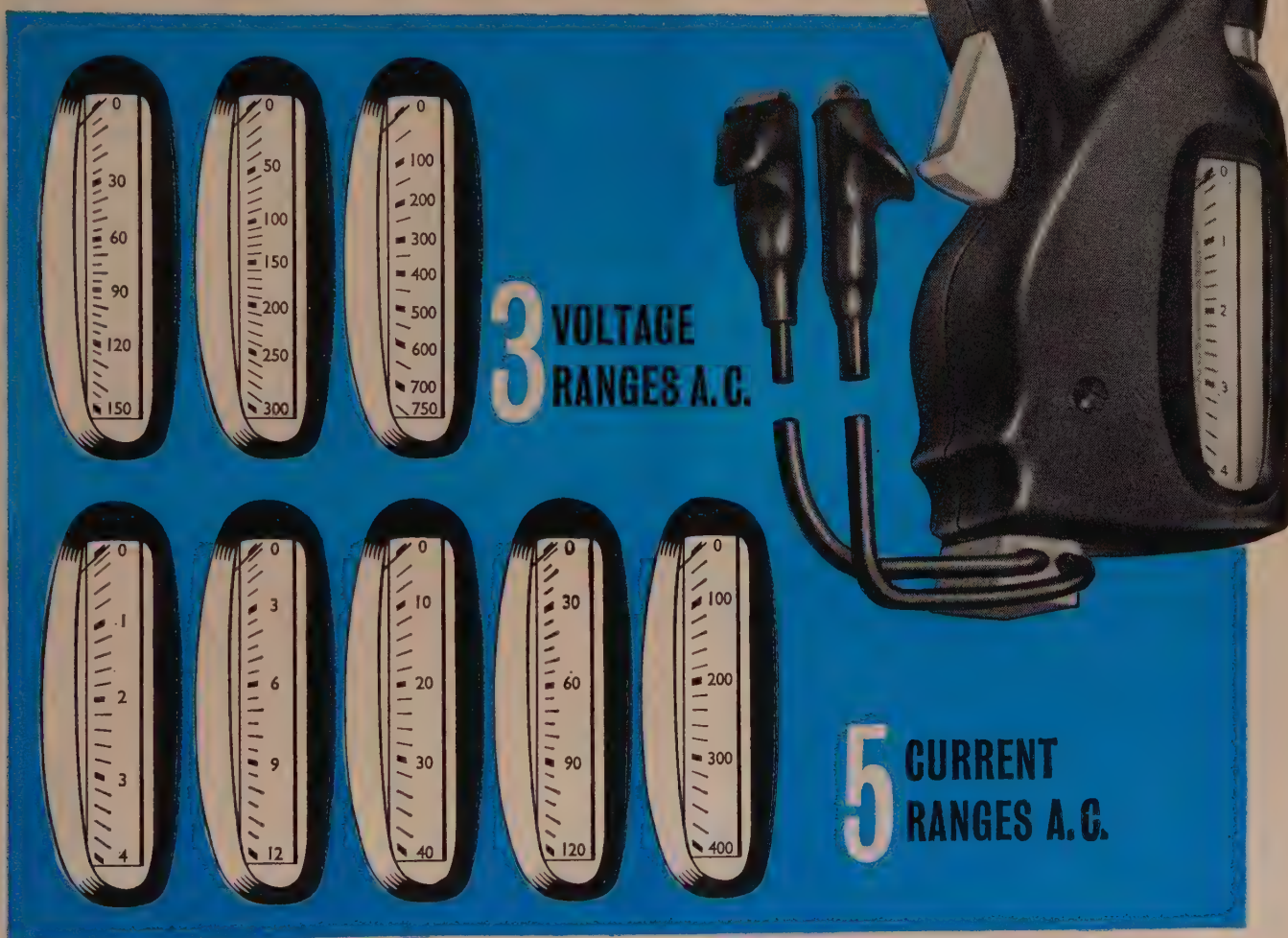


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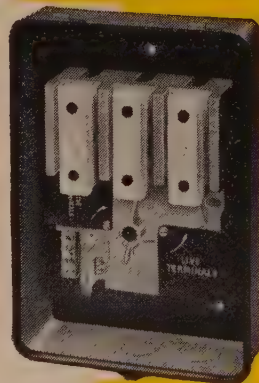
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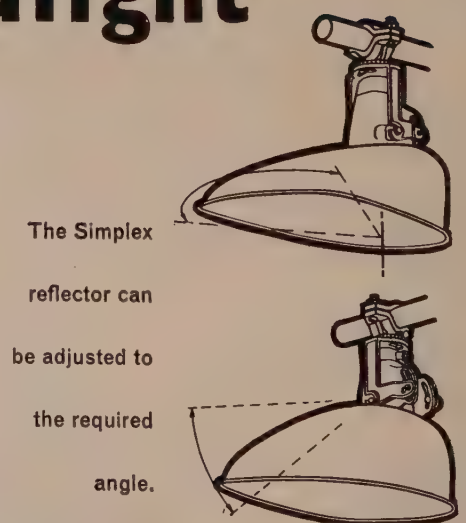




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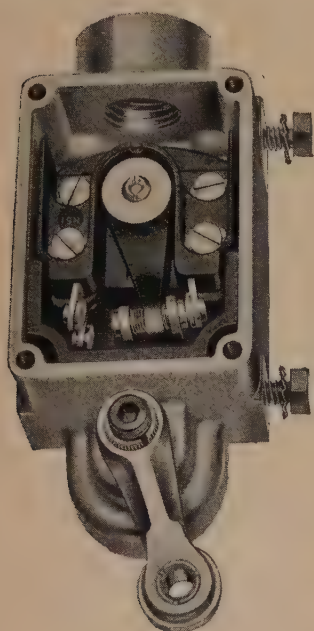
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**NICHROME**  
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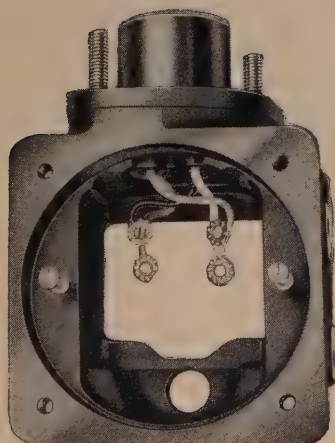




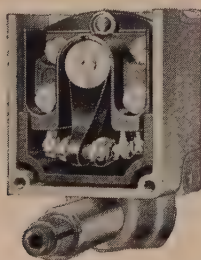
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SNAP-LOCK  
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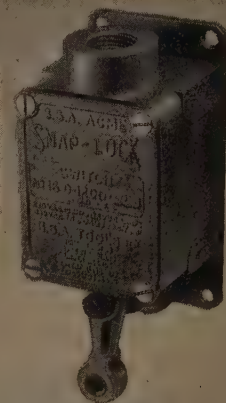
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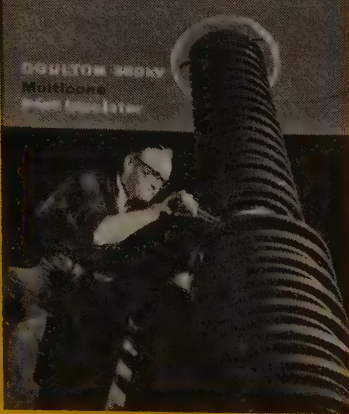
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Publication No. 28



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# Barclays





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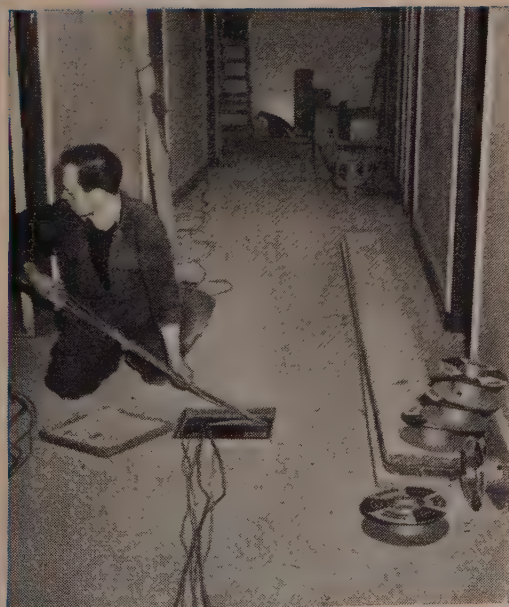


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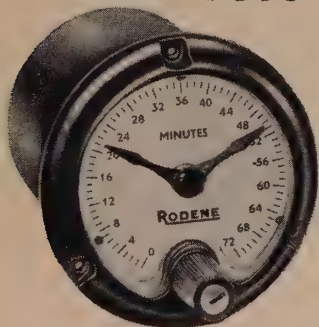
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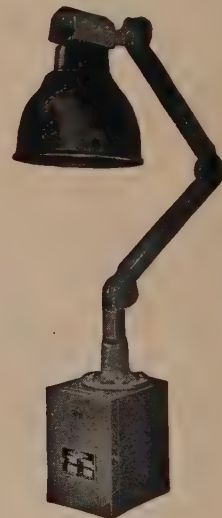
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that's all it takes to instal the

# 'MUTAC CLIPPER'

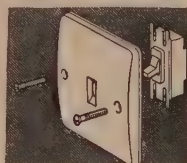
## ARCHITRAVE SWITCH ASSEMBLY



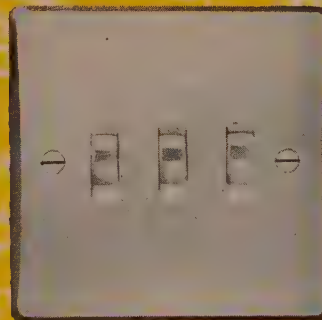
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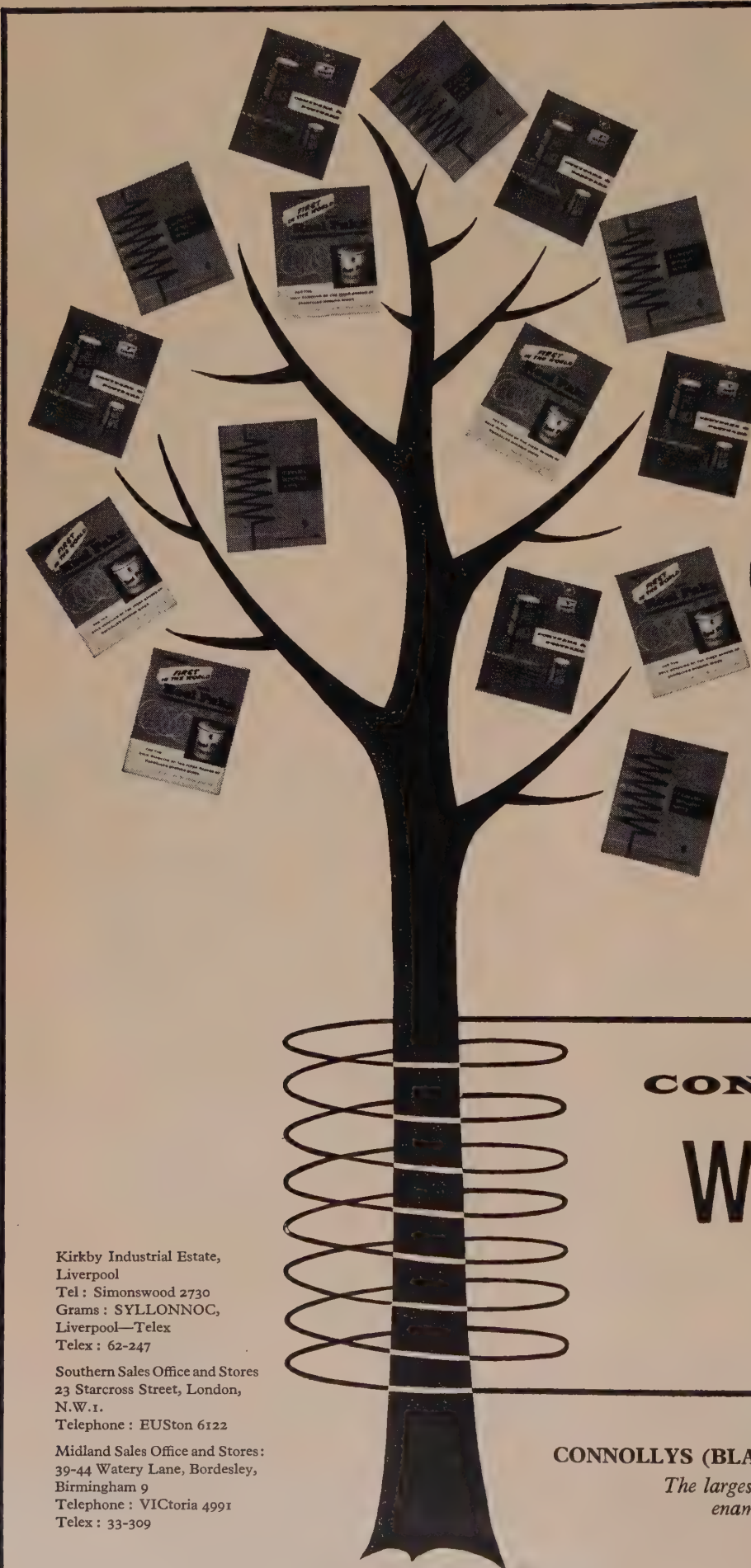
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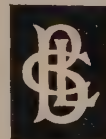
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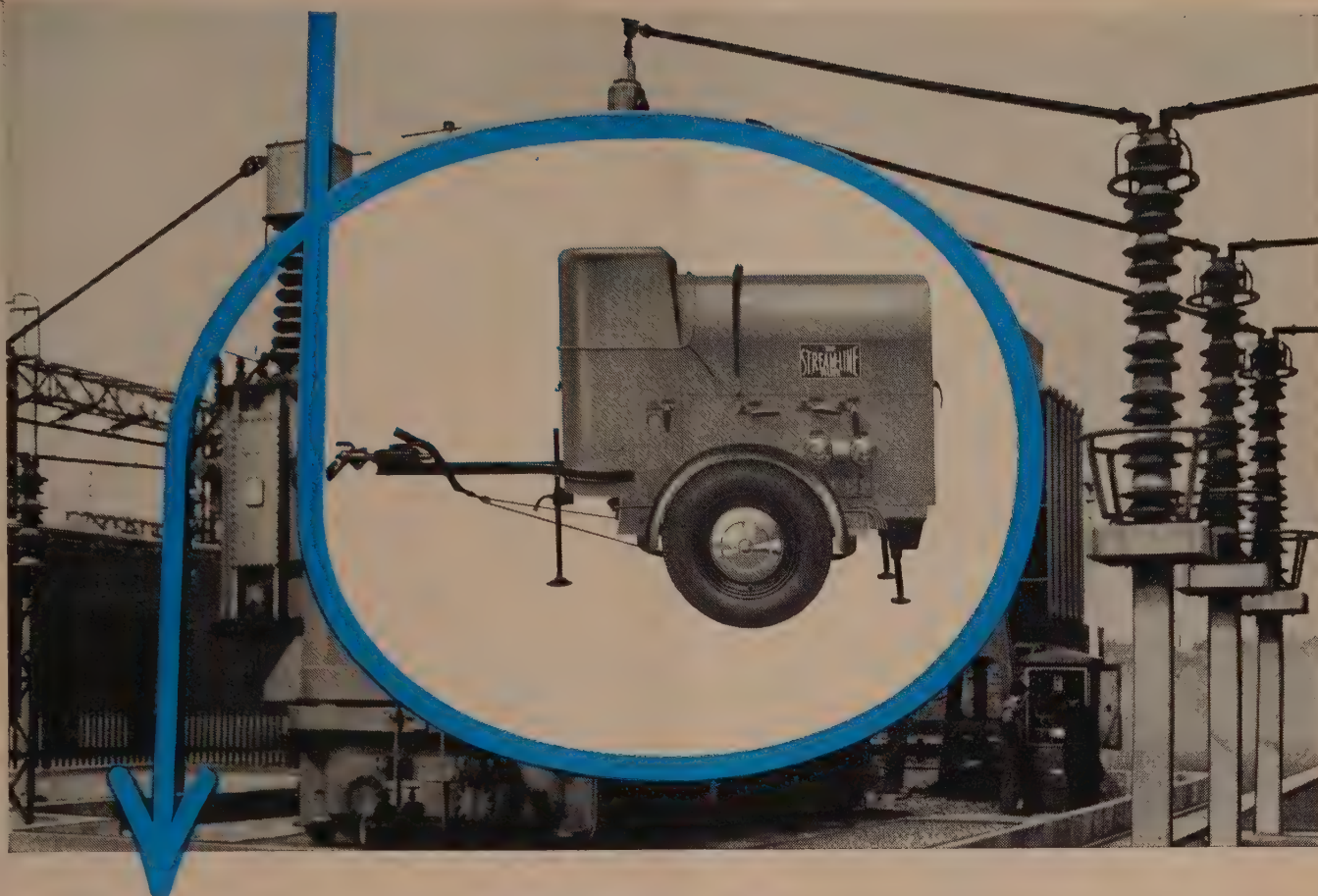
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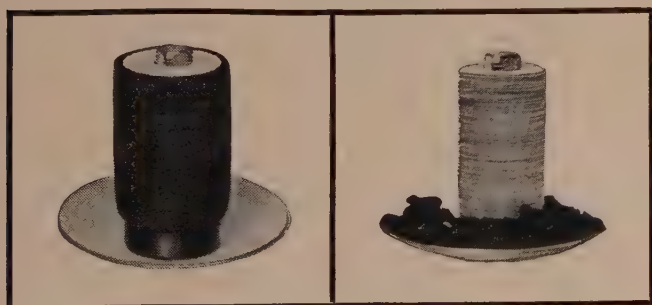
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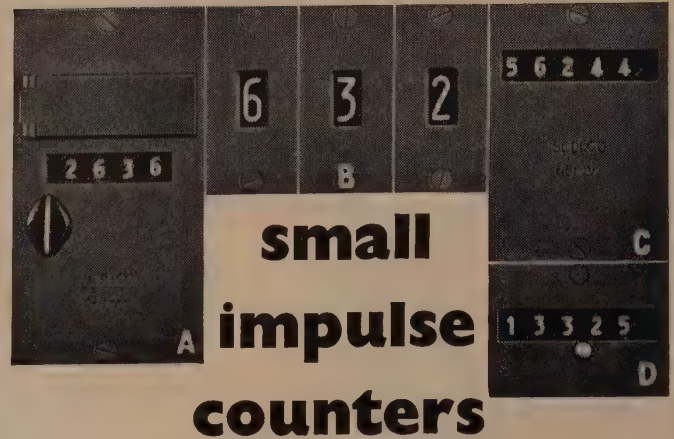
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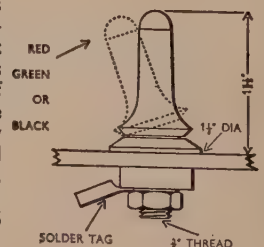
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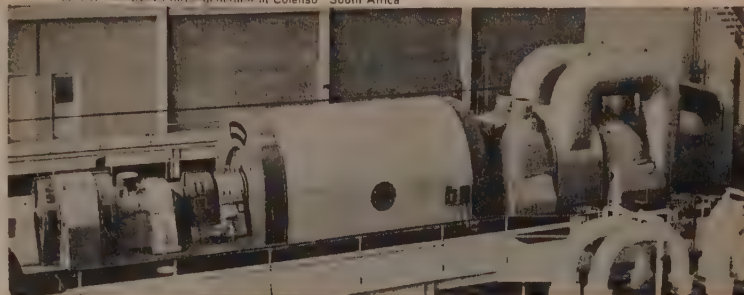
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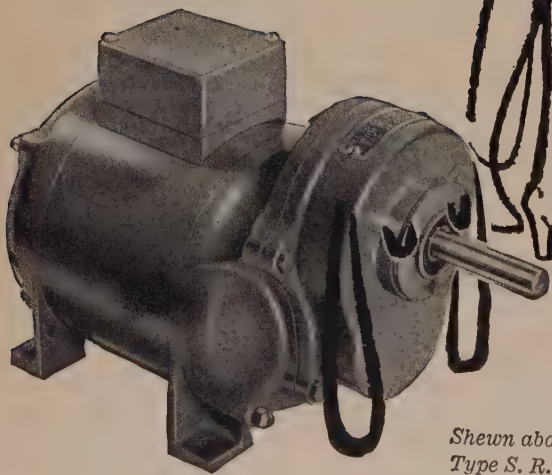


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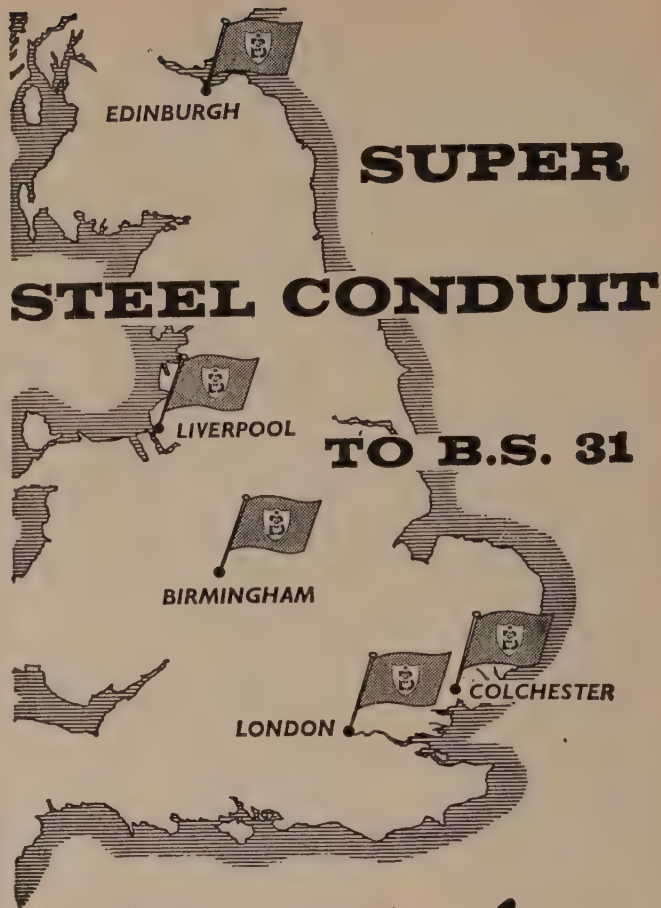
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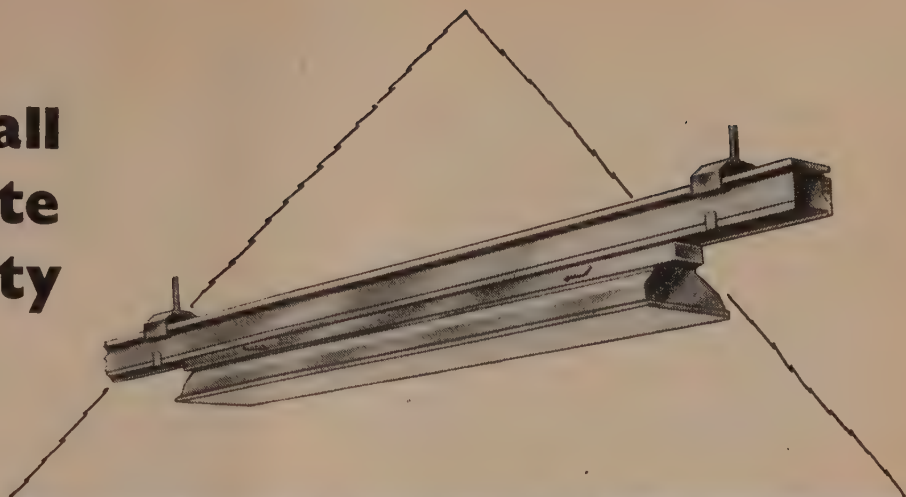
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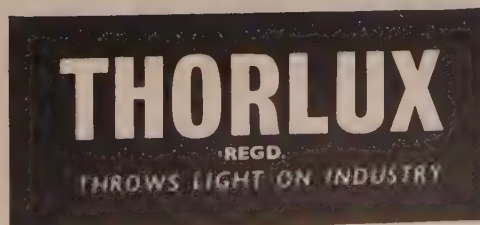
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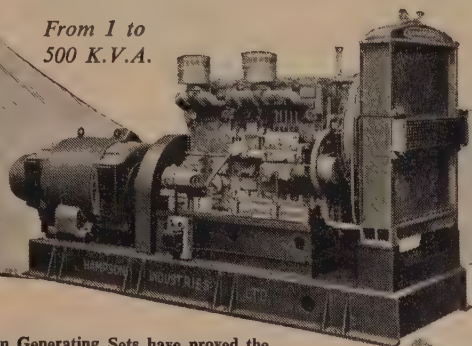
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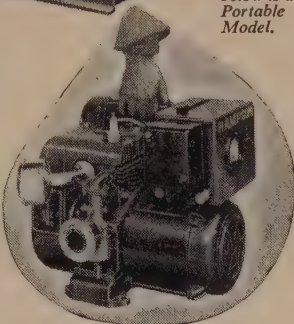
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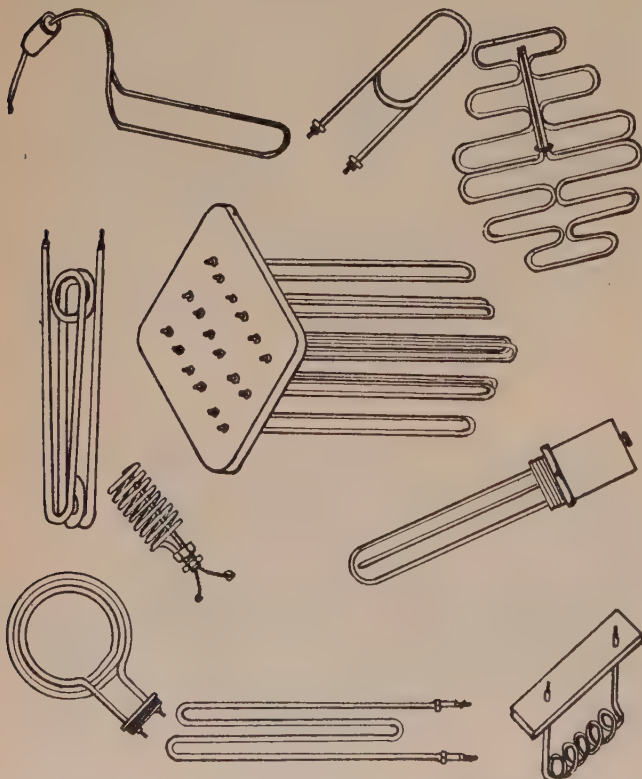


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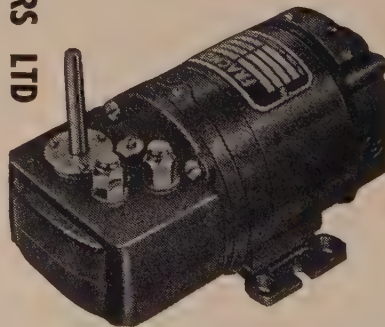
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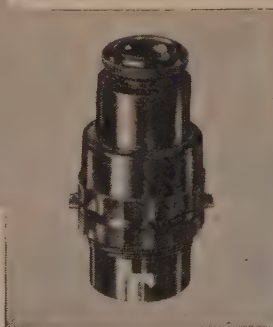
**LAMPHOLDERS**



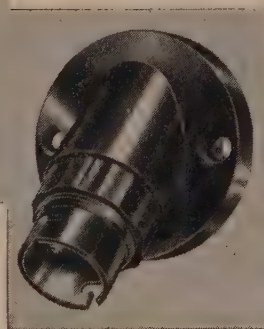
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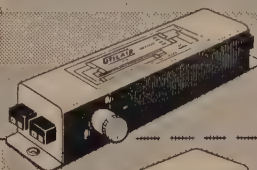
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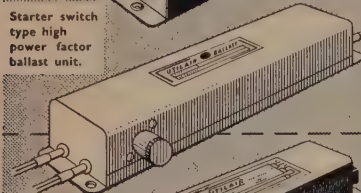


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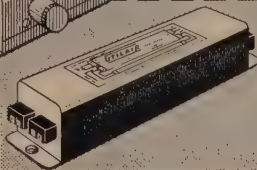
Starter switch  
type choke  
incorporating  
starter holder.



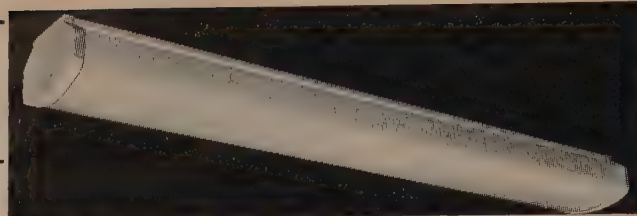
Starter switch  
type high  
power factor  
ballast unit.



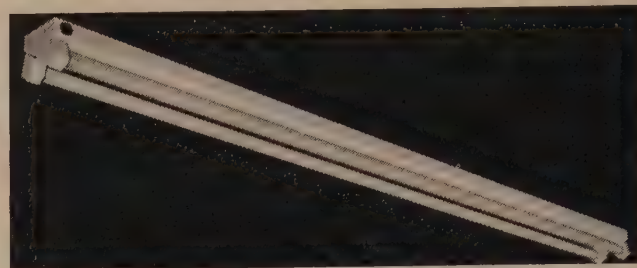
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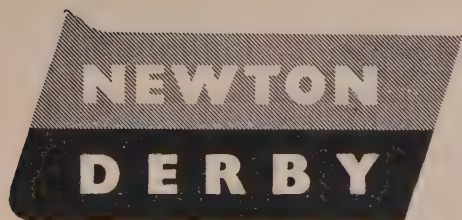
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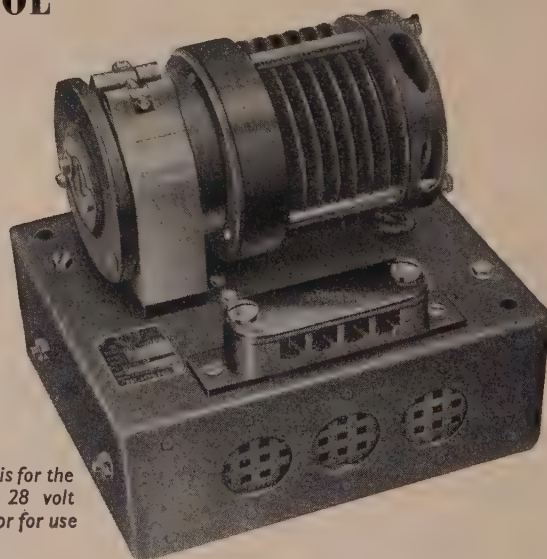
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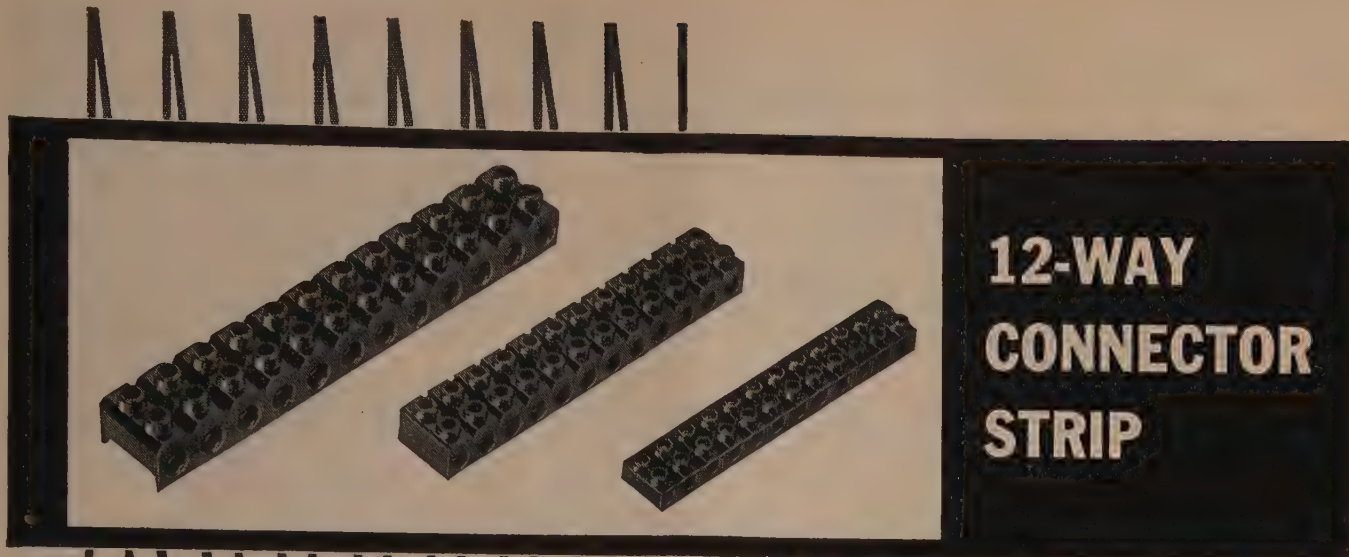
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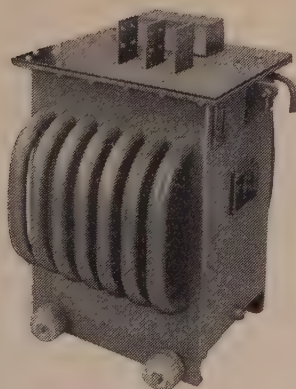
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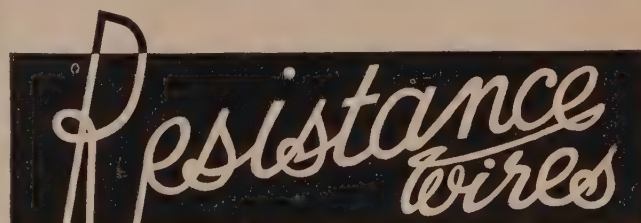


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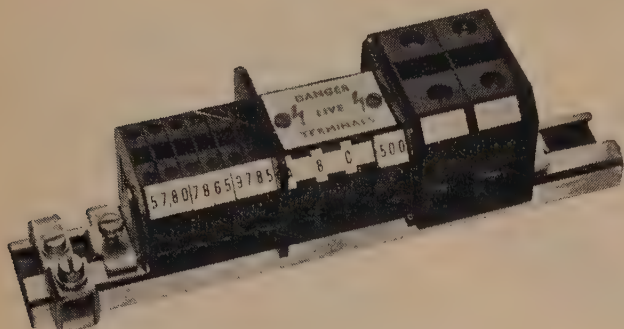
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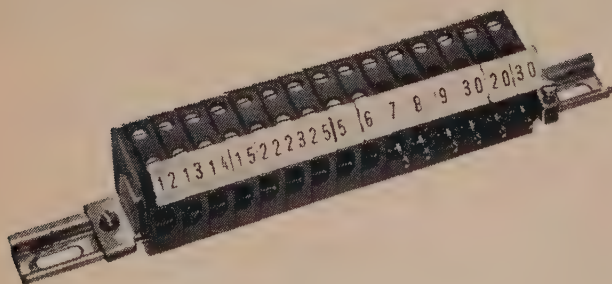


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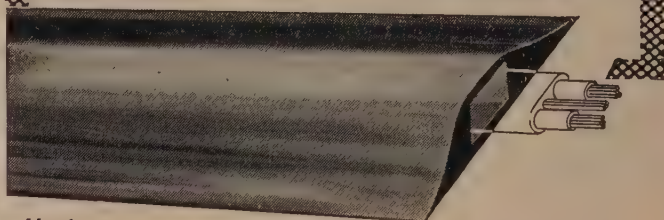
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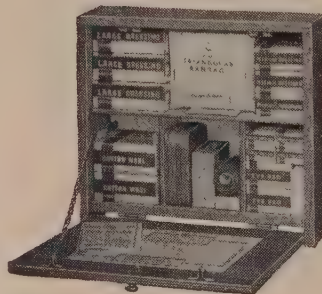
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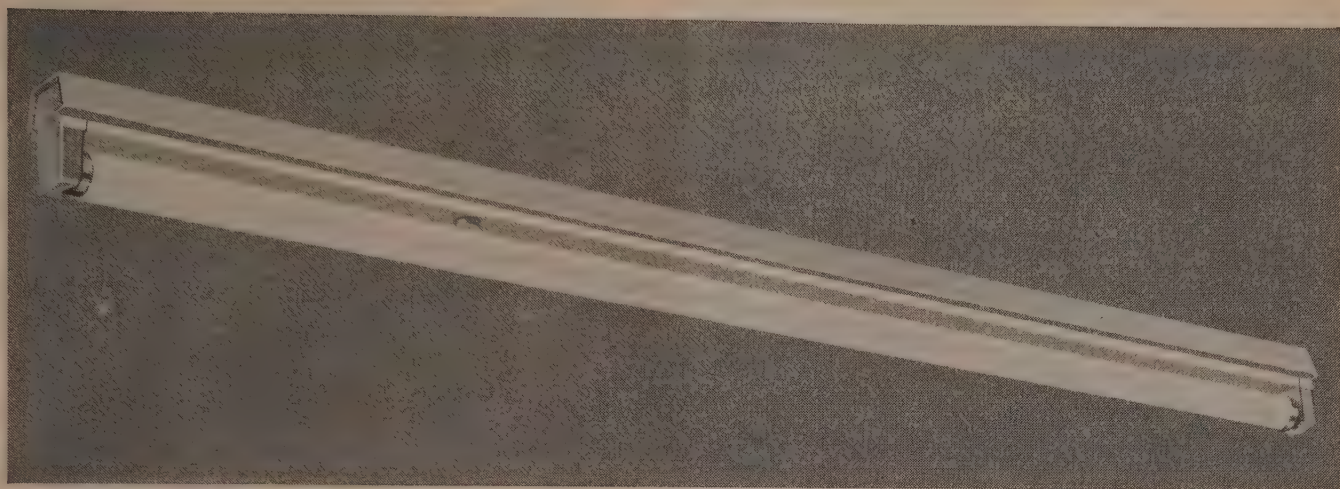
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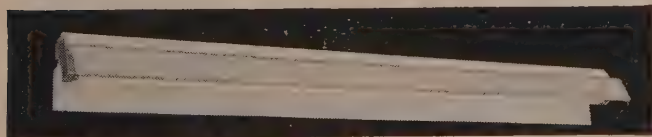
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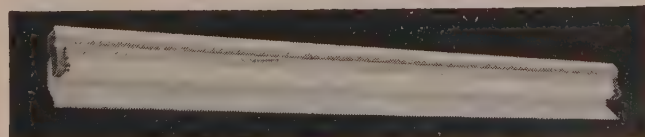
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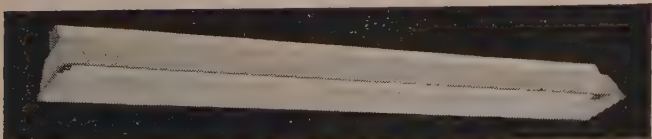
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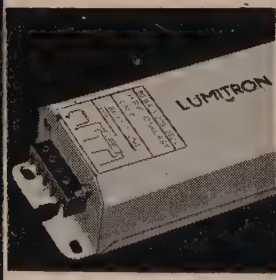
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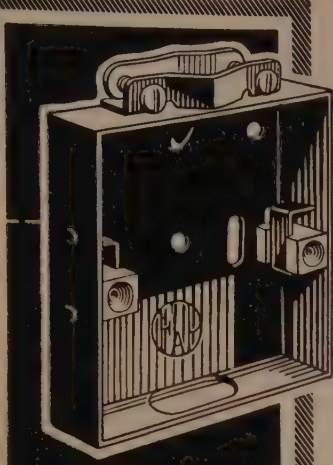
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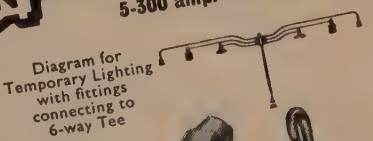
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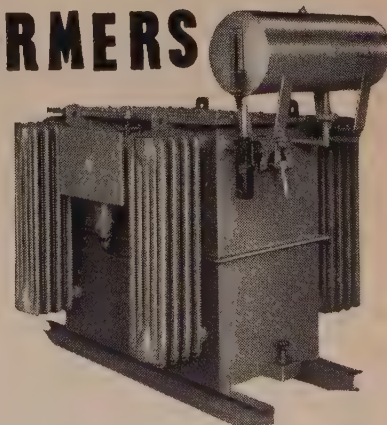


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for "finger-tip" manual or automatic control of power up to 500 KVA

- **TRANSFORMER/RECTIFIER SETS**

**STURDY ELECTRIC CO. LTD.**

HAMSTERLEY COLLIERY, NEWCASTLE UPON TYNE  
Telephone: Ebchester 271-272. Telegrams: Sturditran, Newcastle upon Tyne



# MEKELITE

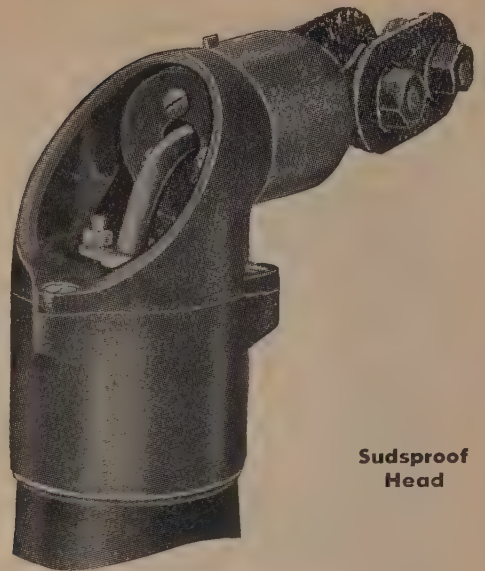
GEARED  JOINT

## INDUSTRIAL LIGHTING UNITS



Scale 1/8 full size

Catalogue sent  
free on request



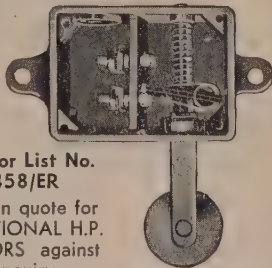
Sudsproof  
Head

Where trouble is experienced on machine tools due to suds getting into the lampholder, the sudsproof head with enclosed lampholder can be used instead of the standard head. Various lengths of arm (maximum horizontal reach 54 in.). With pillar or short vertical pivot. Five sizes of reflector. Bases for wall, bench, ceiling, floor or for mounting direct on machines. Also portable types.

**MEK-ELEK Engineering Ltd., 17 Western Road, Mitcham, Surrey**  
Phone: MITcham 3072 Cable: Mekelok, London

### "BARLECTA"

STOP/START SWITCHES, FIRE  
ALARMS, LIMIT SWITCHES, Etc.



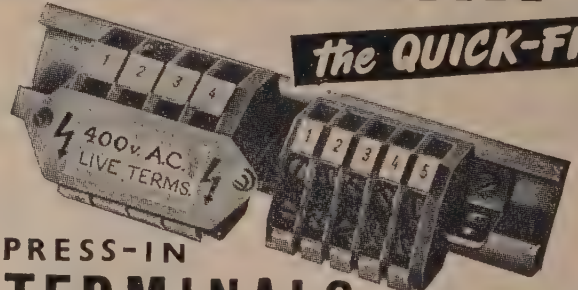
Ask for List No.  
1458/ER

We can quote for  
FRACTIONAL H.P.  
MOTORS against  
enquiry

**BARRIES ELECTRICAL AGENCIES, LTD.**  
**KEMP TOWN, BRIGHTON 7**

### choose **PHOENIX**

*the QUICK-FIX*



### PRESS-IN TERMINALS

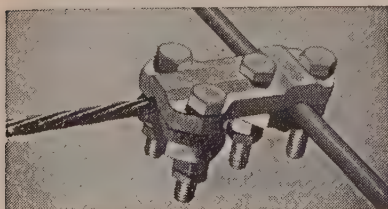
SEND FOR LEAFLET

**D. J. EQUIPMENT (HERSHAM) LIMITED**

43 Queens Rd., Hershham, Walton-on-Thames, Surrey. Tel: Walton-on-Thames 27672

NRP 3270

With range of 20-300  
amps all fitting same  
mounting rail



### Solderless UNIVERSAL CONNECTORS

FOR ALL  
CONNECTIONS  
AND TYPES OF  
CONDUCTORS

**BRITISH SWITCHGEAR CORPORATION LTD**  
MAKERS OF H.T. SWITCHGEAR  
**Morden Factory Estate, London, S.W.19**  
LIB 2273-5

### ADVERTISEMENT BLOCKS

Will advertisers on whose behalf we  
still hold blocks last used between

**3rd January, 1958 and**

**26th December, 1958**

please advise us by the 27th January,  
1961 if they wish them to be returned

**Unwanted blocks will be destroyed**



Be sure, wire with  
**Crompton**

—a good name for  
electric cable

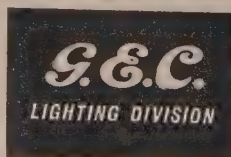


CROMPTON PARKINSON LTD., CROMPTON HOUSE, ALDWYCH, LONDON, W.C.2



# A Captain's Paradise

On December 3rd, Captain Clifford Edgecombe mounted the bridge of the 'Oriana' . . . latest liner of the P. & O — Orient lines. This 42,000 ton, ocean-going paradise (for captain, passengers and crew) slipped her moorings to sail sunward on her maiden voyage to Australia. As night came, on went 14,000 lights . . . all specially designed and supplied by The General Electric Company Limited, making the Oriana look for all the world like an illuminated fairy-tale. This is the largest lighting installation of its kind afloat, but by no means the only one . . . G.E.C. is now the name behind the lighting of the four biggest liners built in Britain since the war. *And G.E.C. contracts for 37 more ships (of all sizes) are in hand.*



THE GENERAL ELECTRIC COMPANY LIMITED, MAGNET HOUSE, LONDON, W.C.2



# Classified Advertisements

CLASSIFIED advertisements are PREPAID at 3/6 per line (approx. 6 words).

DISPLAYED CLASSIFIED:—48/- per single column inch.

Where an advertisement includes a Box Number there is an additional charge of 1/-.

SERIES DISCOUNTS for consecutive insertions:—13, 5%; 26, 10%; 52, 15%.

SITUATIONS WANTED:—Three insertions under this heading can be obtained for the price of two if ordered and prepaid with the first insertion.

Cheques and Postal Orders should be crossed and made payable to ILIFFE ELECTRICAL PUBLICATIONS LTD.

REPLIES TO BOX NUMBERS should be addressed to the Box Number in the advertisement, c/o ELECTRICAL REVIEW, Dorset House, Stamford Street, London, S.E.1. If an applicant for a situation appearing under a Box Number does not wish his reply to be forwarded to a particular firm or individual, instructions to this effect should be addressed to the Advertisement Supervisor, ELECTRICAL REVIEW. The name of an advertiser using a Box Number cannot be disclosed.

## OFFICIAL NOTICES, TENDERS, ETC.

### BOROUGH OF ROMFORD

#### Improvement of Street Lighting: Colchester Road (A.12)

TENDERS are invited for supply and delivery only of 200-watt Sodium Lanterns, lamps, control gear and steel lamp brackets for conversion of 69 existing lighting units.

Specification and form of tender may be obtained from Borough Engineer and Surveyor, Town Hall, Romford, on receipt of cheque for £2 2s., which will be returned on receipt by me of a bona fide tender not later than Monday, 2nd January, 1961.

JOHN E. SYMONS,  
Town Clerk.

Town Hall, Romford. 7003

### NORTH OF SCOTLAND HYDRO-ELECTRIC BOARD

#### 132-kV Transmission Line Spur to Burghmuir (Perth)

TENDERS are invited for the supply, delivery and erection of the above double circuit Steel Tower Line Spur.

Copies of the tender document may be obtained on application to the Board's Chief Electrical and Mechanical Engineer, 16, Rothesay Terrace, Edinburgh, 3, on receipt of a deposit of 2 guineas (returnable).

The Board do not bind themselves to accept the lowest or any tender. 6966

### BOROUGH OF EALING

#### Renewal of Electrical Installation at St. Ann's Secondary Girls' School, Springfield Road, London, W.7

TENDERS are invited for the above-mentioned work. Specification and tender from Borough Engineer, Town Hall, Ealing, London, W.5, on receipt of deposit of £1, returnable on receipt of bona fide tender. Closing date 22nd December, 1960.

E. J. COPE-BROWN,  
Town Clerk. 6908

### CITY OF MANCHESTER

TENDERS are invited for the provision of Road and Car Park Lighting at Manchester Airport, the installation to consist of cut-off Mercury Vapour Lanterns mounted on concrete columns.

Tender forms, returnable by 3rd January, 1961, from the City Surveyor, Town Hall, Manchester, 2. 6985

## SITUATIONS VACANT

(See "Replies to Box Numbers" above)

### BRITISH ENGINE BOILER & ELECTRICAL INSURANCE CO. LTD.

98, West George Street, Glasgow, C.2

ELECTRICAL SURVEYOR required in Scotland. Permanent position carrying progressive salary scale £800 to £1,100 and non-contributory pension. Candidates, aged 26 to 32, with H.N.C. in Electrical Engineering or Grad. I.E.E., and with apprenticeship in manufacture or repair of electrical machinery, are invited to apply stating age, qualifications and experience. 6998

## CENTRAL ELECTRICITY GENERATING BOARD

### London Division

APPLICATIONS are invited for the following posts. Conditions of service in accordance with N.J.M. and H.E. Committee Agreement. Salary includes London allowance. Qualifications entitling to Corporate Membership of I.E.E. or I.Mech.E. an advantage.

#### POWER STATION SUPERINTENDENT, LOMBARD ROAD POWER STATION (Vacancy No. 60/975).

Applicants should have had a wide experience of power station operation, maintenance and administration, and should have a lively sense of responsibility in management/employee relations.

Salary N.J.M. and H.E. Scale, Grade 5, Class A = £1,825 to £2,025 per annum.

#### POWER STATION SUPERINTENDENT, WOOLWICH POWER STATION (Vacancy No. 60/976).

Applicants should have had a wide experience of power station operation, maintenance and administration, and should have a lively sense of responsibility in management/employee relations.

Salary N.J.M. and H.E. Scale, Grade 5, Class B = £2,025 to £2,230 per annum.

Applications, quoting vacancy number, to (or on form from) Personnel Officer, Central Electricity Generating Board, London Division, P.O. Box 136, London, W.1, by 20th December, 1960. 6976

Advertisements are accepted up to first post on Monday of the week of issue

If blocks, bold type or ruled borders are required then on Friday prior to week of issue

## CHRISTMAS

Advertisements for 23rd December are accepted up to First Post on Thursday, 15th December

If blocks, bold type or ruled borders are required then on Wednesday, 14th December

All communications to be addressed to: Classified Advertisement Department, ELECTRICAL REVIEW, Dorset House, Stamford Street, London, S.E.1

Original testimonials should not be sent with applications for employment

## CENTRAL ELECTRICITY GENERATING BOARD

### Midlands Division

ASSISTANT MAINTENANCE ENGINEER (Electrical) is required at Stourport "A" and "B" Power Stations. N.J.B. service conditions, superannuable appointment, salary within Schedule A, Grade K.7, £1,350-£1,500 per annum.

A sound technical training and practical experience in electrical maintenance is required, preferably in a modern power station, and the possession of an appropriate technical qualification will be an advantage.

Apply, quoting Vacancy No. 328/60MD, on form AE6, available from the Station Superintendent, Stourport "A" and "B" Power Stations, Severn Side, Stourport-on-Severn, Worcs., to whom they should be returned to arrive not later than 19th December, 1960. 6961

# BRUSH

A member of the Hawker Siddeley Group—Industrial Division

## DESIGN ENGINEERS DESIGNER DRAUGHTSMEN DRAUGHTSMEN

This Company, which is situated on the outskirts of a small town amid the pleasant Leicestershire countryside, requires fully experienced men in the above categories to work on:

RAIL TRACTION CONTROL GEAR  
A.C., D.C. AND TRACTION ROTATING ELECTRICAL MACHINES  
SWITCHGEAR  
MOTOR CONTROL GEAR  
GENERAL ENGINEERING  
RESEARCH EQUIPMENT

Attractive salaries, stable employment, assistance with housing and removal expenses in appropriate cases are only some of the advantages of coming to work for BRUSH.

We shall be pleased to receive your application, WHICH WILL BE TREATED IN THE STRICTEST CONFIDENCE and you should address it, quoting reference: PL.9903 to

Mr. A. Garner

Brush Electrical Engineering Company Limited  
Loughborough, Leicestershire.



**Situations Vacant (continued)****CENTRAL ELECTRICITY  
GENERATING BOARD****East Midlands Division****GENERAL ASSISTANT ENGINEER,  
WARWICK POWER STATION**

(Vacancy No. 268/60).

Applications are invited for the position of General Assistant Engineer at Warwick Power Station, Emscote Road, Warwick.

The successful applicant will be given the opportunity to obtain operating and maintenance experience. Applicants should be in possession of suitable engineering qualifications.

The salary during the initial training period will depend upon qualifications and knowledge and will be within the range £625-£805 per annum of the National Joint Board Agreement.

Closing date for receipt of applications, 23rd December, 1960.

**ASSISTANT SHIFT CHARGE  
ENGINEER,****DRAKELOW "A" POWER STATION**

(Vacancy No. 269/60).

Applications are invited for the position of Assistant Shift Charge Engineer at Drakelow "A" Power Station, near Burton-on-Trent.

Applicants should have received a sound technical training and have had experience in a modern power station. Preference will be given to candidates who possess the Higher National Certificate or its equivalent.

Salary will be in accordance with Class J, Grade 8 (£1,190-£1,325 per annum) of the National Joint Board Agreement, plus 10% allowance for shift duties.

Closing date for receipt of applications, 23rd December, 1960.

**ASSISTANT SHIFT CHARGE  
ENGINEER, NORTHAMPTON  
POWER STATION**

(Vacancy No. 265/60).

Applications are invited for the position of Assistant Shift Charge Engineer at Northampton Power Station, Nunn Mills Road, Northampton.

Candidates should have sound technical training and practical power station experience in the operation of steam raising and generating plant, main and auxiliary switchgear.

Salary will be in accordance with Class G, Grade 9 (£965-£1,090 per annum) of the National Joint Board Agreement, plus 10% allowance for shift duties.

Closing date for receipt of applications, 12th December, 1960.

**GENERAL ASSISTANT ENGINEER,  
HIGH MARNHAM POWER STATION**

(Vacancy No. 266/60).

Applications are invited for the position of General Assistant Engineer at High Marnham Power Station, near Newark, Notts.

Applicants should hold the Ordinary National Certificate in Mechanical or Electrical Engineering. There are good opportunities for keen engineers who are willing to study new plant and methods.

The salary during the initial training period will depend on qualifications and knowledge and will be within the range £625-£805 per annum of the National Joint Board Agreement.

Closing date for receipt of applications, 16th December, 1960.

These appointments will be pensionable within the terms and conditions of the Electricity Supply (Staff) Superannuation Scheme.

Applications should be submitted on the official form AE6/ACT, which may be obtained from the Station Superintendent concerned and should be returned to him by the date stated.

**ASSISTANT CHEMIST,  
DIVISIONAL LABORATORY**

(Vacancy No. 267/60).

Applications are invited for the position of Assistant Chemist in the Divisional Laboratory at North Wilford Power Station, Queens Drive, Nottingham.

Candidates should be capable of initiating and leading investigations into such topics as air pollution, river pollution, industrial water treatment, analytical method development, and should have a sound knowledge of inorganic analysis.

Candidates should hold a degree or equivalent professional qualification. Previous power station experience is advantageous although not essential.

Salary will be in accordance with Class BX, Grade 8 (£1,105-£1,410 per annum) of the

National Joint Board Agreement, and the position will be pensionable within the terms and conditions of the Electricity Supply (Staff) Superannuation Scheme.

Applications should be submitted on the official form AE6/ACT, which may be obtained from the Divisional Establishments Officer, P.O. Box 25, Barker Gate, Nottingham, and should be returned to the undersigned not later than 31st December, 1960.

O. S. WOODS,  
Divisional Controller.

6992

**COUNTY BOROUGH OF WEST HAM**

**JUNIOR TECHNICAL ASSISTANT (Electricity)** required. Must be familiar with electrical installations in public buildings, workshops and domestic premises, and capable of making adjustments, conducting installation tests, recording data, reporting on compliance with specifications by contractors, and other work of similar character.

Salary maximum of Misc. Grade IV, £685 p.a., plus London allowance £25/£40 p.a. Commencing salary within the above range according to experience.

Applications in writing to Borough Engineer and Surveyor, West Ham Town Hall, Stratford, London, E.15, immediately.

6971

**AIR MINISTRY****Works Designs Branch**

requires in London and Provinces **ENGINEERING DESIGNER DRAUGHTSMEN** experienced in preparation of schemes for illumination and electrical equipment of buildings or schemes for H.V. and M.V. electrical distribution. Candidates should have served recognised apprenticeship or had equivalent training, and also have had practical experience. O.N.C. an advantage. Financial assistance and time off for recognised courses of study. Promotion and pension prospects. 5-day week with 18 days' paid leave per year initially. Overseas tours for which special allowances granted.

Salary in LONDON ranges from £805 (age 25) to £980 p.a.; somewhat lower in PROVINCES. Commencing salary dependent on age, qualifications and experience.

Applicants, who must be natural-born British subjects, should write quoting O/N Kings Cross 4354 to Air Ministry, W.G.d, Theobalds Road, London, W.C.1, or to any Employment Exchange, giving age, details of training, qualifications, full particulars of former posts held and copies of any testimonials. Candidates selected will normally be interviewed in London and certain expenses reimbursed.

250

**M.K. ELECTRIC LIMITED**

have the following vacancies in their Technical Drawing Office:—

**DESIGNERS**—experienced in the design of small Electrical/mechanical products for large quantity manufacture.

**DRAUGHTSMEN**—with routine Drawing Office experience and preferably in connection with small electrical products — preparing standard drawings, data sheets, etc.

Excellent working conditions in a new drawing office. Five-day week of 37½ hours. Holiday arrangements honoured and attractive salaries offered according to experience

Applications treated in strict confidence if addressed to:—

**Technical Manager, M.K. ELECTRIC LTD.**  
**Shrubbery Road, Edmonton, London, N.9**

6885

**TEACHING STAFF (ASSISTANTS,  
GRADES A & B): WAR DEPARTMENT**

**POSTS** for men to teach Mathematics, Science, Engineering (Mechanical or Electrical), General subjects (which may include Art), Metalwork and Woodwork at Army Boys Units at the following places: Aldershot; Arborfield (Berks); Bovington (Hants); Bury St. Edmunds; Canterbury; Carlisle; Chesham (Mon.); Crickhowell (Brecon); Crookham (Hants); Denbury (Devon); Derby; Dover; Exeter; Harrogate; Lichfield; Nuneaton; Oswestry; Preston; Strensall (York); Towyn (Merioneth); Winchester; Woolwich. (Not all subjects are required at every unit.)

Qualifications: University degree, H.N.C., or equivalent in appropriate subjects. Teaching experience is essential for Grade B posts and is desirable for Grade A posts. Qualified teachers without such qualifications and experience will be considered for Grade A posts. Burnham Scales for Establishments of Further Education.

Write Civil Service Commission, Burlington Gardens, London, W.1, for application form, quoting 5237/61. Closing date 3rd January, 1961.

6995

**LONDON ELECTRICITY BOARD****District Commercial Engineer**

**APPLICATIONS** are invited for the above position in the Board's South Eastern District at 44, Powis Street, Woolwich, London, S.E.18.

The successful candidate will be responsible to the District Manager for the supervision and control of the District commercial organisation. Applicants must have experience in the development of electricity supply, control of showrooms, sales staff, administration and operation of hire and hire-purchase schemes, electrical contracting change-over work and consumers' service. Appropriate technical qualifications would be an advantage.

The post is graded within Classification D, Grade 2 of the National Joint Managerial and Higher Executive Grades Agreement, salary range £1,825 to £2,025 per annum, inclusive of London allowance.

Application form obtainable from the Secretary, 46, New Broad Street, London, E.C.2, to be returned completed within ten days of the publication date of this notice. Please quote ref. PER/V/3149/R.

6970



## AIR MINISTRY

**STATION ENGINEERS (G.D.)** and **STATION ENGINEERS (Mech.)** required at R.A.F. and Ministry of Aviation stations throughout the United Kingdom. The work of Station Engineers (G.D.) consists of installation, operation and maintenance of high and medium-voltage electrical distribution systems, electrical power and lighting installations, control systems and generating plant; knowledge of heating and ventilating plant and diesel engines an advantage. Station Engineers (Mech.) are concerned with diesel power plant, steam and hot water heating systems, refrigeration and air conditioning and miscellaneous workshop plant, tools and equipment.

Candidates should hold O.N.C. Elec. or Mech./C. and G. Electrical Technicians Certificates/2nd Class M.O.T. Certificate or equivalent, and must also have had recognised apprenticeship with firm of good repute plus 3 years' employment in electrical or mechanical and engineering, preferably on operation and maintenance of mine, factory or workshops plant and services. Preference to candidates with supervisory experience.

Commencing salary, which is dependent upon age, qualifications and experience, ranges from £745 (age 25) to £925 max. in Grade III. There are pension prospects and also opportunities of advancement to numerous posts in the higher grades vacancies which, as a rule, are filled by promotion of Grade III staff, viz.:-

|                                  |               |
|----------------------------------|---------------|
| Technical Grade II .....         | £925-£1,055   |
| (276 posts)                      |               |
| Inspector of Works Grade I ..... | £1,055-£1,295 |
| (137 posts)                      |               |
| Technical Grade B .....          | £1,295-£1,491 |
| (25 posts)                       |               |
| Technical Grade A .....          | £1,385-£1,630 |
| (17 posts)                       |               |

Overseas tours for which special allowances ranging at present up to £1,800 p.a. are payable in addition to a higher salary. Internal training courses are provided and financial assistance and time off is allowed for recognised courses of study leading to higher qualifications. 5-day week with 18 days' paid leave a year initially.

Applicants, who must be natural-born British subjects, up to age 55, should write stating age, qualifications and experience to the Manager (P.E.R.), Ministry of Labour, Professional and Executive Register, Atlantic House, Farringdon Street, London, E.C.4. No original testimonials should be sent. Candidates selected will normally be interviewed in London and certain expenses reimbursed. Only applicants selected for interview will be advised. 249

CITY OF CARDIFF  
EDUCATION COMMITTEE

## Llandaff Technical College

Principal: J. Cotterell, M.I.E.E., A.I.Mech.E., A.M.I.Prod.E.

## Department of Electrical Engineering

**APPLICATIONS** are invited for the post of **ASSISTANT LECTURER GRADE A** in the Electrical Engineering Department. Duties to commence as soon as possible.

The Department provides Sandwich, Block Release and Part-time Day Courses for O.N.C., City and Guilds Technicians, Installation and Radio. The successful applicant will be required to teach electrical engineering up to S.3 O.N.C. standard. Applicants should possess suitable technical qualifications, e.g., Degree, A.M.I.E.E. or H.N.C. in Electrical Engineering, together with industrial experience. Teaching experience would be an advantage.

Salary in accordance with the Burnham Technical Scale for Assistant Lecturers Grade A, £520 x £27 10s. to £1,000. An addition of up to 12 annual increments may be made to the starting salary for approved industrial or teaching experience, and additional payment may be made for approved training.

Application forms, which should be returned within 14 days of the appearance of this advertisement, and further particulars are obtainable from the undersigned on receipt of a stamped addressed envelope.

ROBERT E. PRESSWOOD,  
Director of Education.

City Hall,  
Cardiff.

6969

LITTLEWOODS MAIL ORDER STORES  
LIMITED

have vacancies for

## ASSISTANT ELECTRICAL ENGINEERS

**APPLICANTS** should be of H.N.C. standard and have served an Electrical Apprenticeship. They must be capable of carrying out the following duties in the planning of New Chain Stores, Factories and Offices :-

- Design of lighting schemes.
- Preparation of working drawings and distribution layouts.
- Preparation of complete specifications and schedules for medium-voltage electrical installations of lighting and power to the order of approximately 200 kW; also heating and ventilation control circuits.
- Site supervision.

Estimating experience would be an advantage.

We have a large and varied building programme throughout Great Britain.

The Company's conditions of employment include a five-day week, a generous sickness scheme, and a contributory pension and life assurance scheme.

Write for application form to :-

The Employment Manager  
(Ref. AEE/100/ER)

LITTLEWOODS MAIL ORDER STORES LTD.

Central Personnel Department  
Spinney House, Church Street, Liverpool X

6974



(A member of the Hawker Siddeley Group — Industrial Division)

## TENDERING &amp; CONTRACTS ENGINEERS

This Company needs additional Tendering and Contracts Engineers in the Rotating Machines Commercial Department to cope with continuing expansion. Preference will be given to technically qualified men with appropriate commercial experience of rotating electrical machines.

**APPLICATIONS WILL BE TREATED IN THE STRICTEST CONFIDENCE** and should contain brief details of experience and qualifications. Applications should quote reference number PL 9902 and be addressed to :-

Mr. A. Garner  
Brush Electrical Engineering Company Limited  
Loughborough, Leicestershire

6909



## SALES ENGINEER

Resulting from a promotion to an overseas appointment within the Company, a vacancy occurs at our London Office for a qualified electrical engineer with sales experience.

The man appointed will be responsible for selling cables, transformers and switchgear to the Oil Industry and to certain indirect export houses in London. He will probably be in the 30-40 age group and be an Associate or Graduate Member of the I.E.E.

This is a senior appointment with good salary and prospects. The man appointed will participate in the Company's pension scheme and a car will be provided.

Applications giving full details should be addressed to :-

THE EMPLOYMENT AND WELFARE MANAGER  
**JOHNSON & PHILLIPS LIMITED**  
VICTORIA WAY, CHARLTON, LONDON, S.E.7

6990



## Situations Vacant (continued)



(A member of the Hawker Siddeley Group —  
Industrial Division)

## RESEARCH DIVISION

### INDUSTRIAL ELECTRONICS

Vacancies exist for Senior and Intermediate Grade Research and Development Engineers with previous experience in one or more of the following fields:—

Pulse circuitry  
Digital computers  
Transistor circuitry  
System design  
Line communication

The qualifications required for the Senior grade would normally include an Honours degree in Electrical Engineering or Physics.

### COMPUTER APPLICATIONS

Vacancies exist for Engineers, Applied Mathematicians and Physicists, to work on the application of a digital computer to the design of heavy electrical plant. Previous experience is desirable but not essential.

The Company is situated on the outskirts of a small town, amid the pleasant Leicestershire countryside. Loughborough offers many fine schools of all grades and there are facilities for advanced studies at Technical Colleges and Universities in the district. Successful candidates can look forward to an attractive salary and stable employment.

In appropriate cases, assistance can be given with housing and removal expenses.

Applications, WHICH WILL BE TREATED IN THE STRICTEST CONFIDENCE, should give brief details of experience, qualifications and field of interest, and should be addressed to

Mr. P. A. McCaig

### BRUSH ELECTRICAL ENGINEERING COMPANY LIMITED LOUGHBOROUGH - LEICESTERSHIRE

quoting reference: PL9099

6886

### SOUTHERN ELECTRICITY BOARD

#### Assistant Engineer (Maintenance and Operation)

Heston District of No. 1 (Southall) Sub-Area. Salary N.J.B. Class G, Grade 9 (£1,015-£1,140 per annum, inclusive of London allowance). N.J.B. conditions of service.

The duties of the post will be to assist with the maintenance and operation of switchgear, transformers, auxiliary gear and underground cables up to and including 11 kV. The appointment will involve standby duties. Rented housing accommodation may be made available.

Applications on forms obtainable from the Sub-Area Secretary, 2/6, Windmill Lane, Southall, Middlesex, and returned to him, quoting Z.1197, not later than 19th December, 1960.

#### Assistant Engineer (Installations)

Bournemouth District of No. 4 (Bournemouth) Sub-Area. Salary N.J.B. Class J, Grade 11 (£965-£1,090 per annum). N.J.B. conditions of service.

The successful candidate will be required to assist the Grade 9 Assistant Engineer (Installations) in the control and organisation of the work of the Installations Section of the District Engineering Department.

Applicants should have had sound experience in electricity supply distribution. Previous experience in metering work and in testing and inspecting consumers' installations and the possession of suitable technical qualifications will be advantages.

Applications on forms obtainable from the Sub-Area Secretary, 1, Priory Road, Bournemouth, and returned to him, quoting Z.1289, not later than 19th December, 1960.

#### Assistant Engineer (Maintenance and Operation)

Portsmouth District of No. 3 (Portsmouth) Sub-Area. Salary N.J.B. Class J, Grade 11 (£965-£1,090 per annum). N.J.B. conditions of service.

The duties of the post will be to assist with

the maintenance and operation of H.V. and L.V. distribution mains and substations and with minor construction work. A technical training to H.N.C. standard and experience of similar work are required.

Applications on forms obtainable from the Sub-Area Secretary, Lower Drayton Lane, Cosham, Portsmouth, and returned to him, quoting Z.1286, not later than 19th December, 1960.

#### Assistant Engineer (Maintenance and Operation)

Melksham District of No. 2 (Newbury) Sub-Area. Salary N.J.B. Class G, Grade 9 (£965-£1,090 per annum). N.J.B. conditions of service.

The duties of the post will be to assist with the maintenance and operation of H.V. and L.V. distribution mains and substations and with minor construction work. A technical training to H.N.C. standard and experience of similar work are required.

Applications on forms obtainable from the Sub-Area Secretary, 7, Oxford Road, Newbury, Berks., and returned to him, quoting Z.1291, not later than 19th December, 1960.

#### Assistant Engineer (Local)

Newbury District of No. 2 (Newbury) Sub-Area, located at Andover. Salary N.J.B. Class F, Grade 10 (£825-£940 per annum). N.J.B. conditions of service.

Applicants should have experience in the design, construction, operation and maintenance of H.V. and L.V. overhead and underground distribution equipment, and possess suitable technical qualifications.

Applications on forms obtainable from the Sub-Area Secretary, 7, Oxford Road, Newbury, Berks., and returned to him, quoting Z.1256, not later than 19th December, 1960.

The successful candidates for the above appointments will be required to contribute to the Electricity Supply (Staff) Superannuation Scheme, if eligible.

7015

### LONDON ELECTRICITY BOARD

#### Assistant Distribution Engineer

APPLICATIONS are invited for the above position at Falcon House, Aldersgate Street, London, E.C.1.

Applicants should have a sound technical education to the standard of the Higher National Certificate, and possess practical experience in all branches of engineering work associated with the organisation of a district distribution department.

The post is graded under Schedule A of the National Joint Board Agreement as Class J, Grade 11, £1,015 per annum rising to £1,140 per annum, inclusive of London allowance.

Applications stating age, qualifications and experience should be sent direct to the Manager, Central District, Falcon House, Aldersgate Street, London, E.C.1, to reach his office not later than ten days from the publication date of this notice. Please quote ref. PER/V/3154/R.

7023

### SOUTH OF SCOTLAND ELECTRICITY BOARD

APPLICATIONS are invited for a superannuable appointment as a THIRD ASSISTANT ENGINEER in the System Design Section of the Chief Engineer's Department at Board Headquarters.

The successful candidate will be engaged on planning the Board's distribution system for all voltages up to and including 33 kV. Candidates should have had previous experience in the construction and operation of distribution systems and some experience in their design would be an advantage. They should possess an engineering degree or qualifications for Corporate Membership of the Institution of Electrical Engineers.

Salary N.J.B. Class BX, Grade 8, £1,105/£1,410 per annum.

Applications quoting reference E46/60, should be submitted to the Secretary, South of Scotland Electricity Board, Inverlair Avenue, Glasgow, S.4, not later than 23rd December, 1960.

7018

### THE NUCLEAR POWER GROUP requires

#### PROJECTS AND PLANNING ENGINEERS

THE Group, now engaged on the construction of four major nuclear power stations in the United Kingdom and overseas, invites applications from suitably experienced men for positions in its PROJECTS DEPARTMENT.

#### PROJECTS ENGINEERS

Vacancies exist for Mechanical, Electrical and Civil Engineers, to assist in the preparation of large contracts for plant and equipment. The duties comprise co-ordination of tenders, preparation of enquiries and orders for major plant and subsequent instructions to contractors during manufacture and construction. Previous experience of large engineering contracts, preferably in the power industry, is necessary. Candidates should be members of an engineering institution or possess exempting qualifications.

#### PLANNING ENGINEERS

The work involves preparation of overall programmes, from tender to final completion of power station projects. Site construction experience and also some experience in planning, involving co-ordination of major engineering contracts, is desirable, and candidates should be members of an engineering institution or possess exempting qualifications.

The company operates a contributory pension scheme, and assistance with house purchase is given to married men.

Applications, giving full details of age, qualifications and experience, should be addressed to:—

#### The Personnel Manager

THE NUCLEAR POWER GROUP  
Radbrooke Hall, Knutsford, Cheshire  
quoting reference ER/PROJ/15

6983





have  
the  
following  
vacancies

## FULLER ELECTRIC LIMITED

A MEMBER OF THE HAWKER SIDDELEY GROUP

### CURRENT TRANSFORMER DESIGNER

Applicants should be suitably qualified and must have been previously engaged upon this type of work. Should the successful applicant so desire, he will be given an opportunity to gain experience in power transformer design.

### CONTROL GEAR DRAWING OFFICE

Control Gear Draughtsmen for industrial and power station cubicle work.

### JUNIOR TECHNICAL SALES ENGINEER

for Transformer Sales Department. Applicants should have knowledge of High Voltage Power Equipment and some commercial experience.

### PRINTING AND ALLIED INDUSTRIES DRAWING OFFICES

Electrical Draughtsmen for detailing and layout of wiring and cable diagrams for electrical driving equipment.

### OUTSIDE TECHNICAL SALES ENGINEER

for variable speed commutator motors and other industrial electrical equipment. Engineers with experience of standard industrial drives and/or merchant marine will be given preference. Car provided.

### TEST ASSISTANT

for on-load tap changer test department. Staff position. Young men aged 23-30 with suitable background and experience will be considered for training.

Salaries will be commensurate with age, qualifications and experience.

Should you be interested in any of these vacancies, on receipt of a post card we will send you an application form for completion.

Apply in the first instance to the Personnel Manager

**FULLER ELECTRIC LIMITED, Fulbourne Road, London, E.17**

6967



**MIDLANDS  
ELECTRICITY  
BOARD**

APPLICATIONS are invited for the following superannuable posts:—

**Wolverhampton & District Sub-Area**

**THIRD ASSISTANT ENGINEER**

(Construction, Operation and Maintenance) (Engineering Dept.) (Headquarters).

Duties will be to assist as necessary in all the work of the Construction, Operation and Maintenance Section. Technical qualifications desirable. Salary £1,190/£1,325 per annum (N.J.B. Grade L.10).

**FOURTH ASSISTANT ENGINEERS**

(Two) (Engineering Dept.) (Headquarters).

Duties will be of a general nature within the Technical and Planning Section. Salary according to experience and qualifications, £965/£1,090 per annum (N.J.B. Grade L.13) or £1,040/£1,165 per annum (N.J.B. Grade L.12).

**THIRD ASSISTANT DISTRICT COMMERCIAL ENGINEER**

(Cannock). Applicants should have wide experience in repairs to consumers' wiring and apparatus and will be required to control service workshops, including radio and television service section. Technical qualifications desirable. Salary £825/£940 per annum (N.J.B. Grade F.10).

Apply by letter, within 10 days, stating age, experience, qualifications, present position and salary to Mr. D. Holt, Sub-Area Manager, Midlands Electricity Board, 83, Darlington Street, Wolverhampton.

F. W. CATER,  
Secretary. 6986

### VACANCY OF INTEREST TO GRADUATES IN ENGINEERING AND EXPERIMENTAL PHYSICS

**EXAMINER OF APPLICATIONS FOR PATENTS.** Salary scale (man) £590 to £1,300. Commencing salary up to £1,108. Age limits 23-45 years, with extensions.

Essential: Degree (or equivalent) in Engineering or First or Second Class Honours Degree (or equivalent) in Experimental Physics; and satisfactory knowledge of light current electrical engineering or electronics.

Application forms, etc., from Secretary, Civil Service Commission, 45, Upper O'Connell Street, Dublin.

Latest time for receiving completed application forms: 5 p.m. on 10th January, 1961. 6978

### J. LYONS & COMPANY LIMITED

(Electrical Section)

require

### ELECTRICAL ENGINEERS

between the age of 22 and 25

**PRELIMINARY** training period of 18 months to 2 years is offered, leading to permanent supervisory positions in various sections of the company's establishments.

Starting salary according to age and experience.

Applicants should have at least 2 years' practical experience in installations work, H.V. and L.V. distribution, modern control gear and process control methods.

Qualifications to Higher National Certificate standard.

Write giving details of education, technical and personal background to:—

**The Personnel Manager  
Works Department**

**J. LYONS & CO. LTD.**  
143, Hammersmith Road, London, W.14  
6973

### TECHNICAL INSTRUCTOR (ELECTRICAL)

required by KENYA GOVERNMENT Education Department. Appointment at candidate's option either on probation to permanent and pensionable establishment or on contract for one tour with gratuity at rate 13½% of total salary drawn. Normal tour 36/45 months. Commencing salary according to age and experience up to maximum, in scale (including inducement addition) rising to £1,341 a year. Outfit allowance £40. Free passages. Liberal leave.

Candidates, under 45 years of age, must possess C. and G. Final Certificate or O.N.C. in Electrical Engineering and have had practical experience. Duties will be teaching the practical work to students taking C. and G. and O.N.C. courses in the Kenya Polytechnic, Nairobi.

Apply to CROWN AGENTS, 4, Millbank, London, S.W.1, for application form and further particulars, stating age, name, brief details of qualifications and experience, and quoting reference M2A/51021/EF. 6979

### SOUTH OF SCOTLAND ELECTRICITY BOARD

Fife Area

**Second Assistant District Engineer,  
Fife Eastern District**

APPLICATIONS are invited from Engineers with a sound training and subsequent experience in H.V. and L.V. distribution systems.

Candidates should possess the Higher National Certificate in Electrical Engineering or equivalent qualification.

N.J.B. conditions and salary, N.J.B. Class F, Grade 7, Scale 8, £1,040/£1,165 per annum; post superannuable, subject to satisfactory evidence of health. The successful candidate will require to reside within a reasonable distance of the District Office at Cupar.

Applications, on standard form obtainable from the Area Manager, S.S.E.B., East Port, Dunfermline, should be returned to him not later than Friday, 16th December, 1960. 6975



**Situations Vacant (continued)****YORKSHIRE ELECTRICITY BOARD****No. 7 (Grimsby) Sub-Area****SECOND ASSISTANT ENGINEER**  
(Industrial Development).

Candidates should hold at least the Higher National Certificate in Electrical Engineering and will be required to advise consumers on the utilisation of electricity in industry. They should also have experience in negotiations for supply to industrial consumers. Experience of street lighting, industrial space heating and a knowledge of general tariff structures will be an added advantage.

Salary N.J.B. Class K, Grade 7 (Scale 12), £1,350/£1,500 per annum.

Applications, together with the names of two referees, should be sent to the Manager, Yorkshire Electricity Board, No. 7 (Grimsby) Sub-Area, Moss Road, Grimsby, not later than 23rd December, 1960.

**No. 1 (Bradford) Sub-Area****BRADFORD DISTRICT****THIRD ASSISTANT DISTRICT ENGINEER (2 posts).**

Applicants should have passed the Graduate-ship examination of the Institution of Electrical Engineers or hold recognised equivalent technical qualifications, have substantial experience in construction, operation and maintenance of high-voltage systems, underground cables and overhead lines, substations and medium and low-voltage networks, preferably including direct current systems.

Candidates must be prepared to reside within the District and undertake standby duties if required.

Salary N.J.B. Class K, Grade 9 (Scale 10), £1,190/£1,325 per annum.

**SUB-AREA HEADQUARTERS****FOURTH ASSISTANT ENGINEER**

(Operation and Maintenance).

Applicants should hold Graduate Membership of the Institution of Electrical Engineers or other acceptable technical qualifications. They should have had sound experience in the operation and maintenance of overhead and underground distribution networks, working at voltages preferably up to 33 kV. This post will involve participation in standby duties.

Salary N.J.B. Class L, Grade 13 (Scale 7), £965/£1,090 per annum.

Applications, together with the names of two referees, should be sent to the Manager, Yorkshire Electricity Board, No. 1 (Bradford) Sub-Area, 45/53, Sunbridge Road, Bradford, 1, not later than 23rd December, 1960.

**No. 4 (Leeds) Sub-Area****FOURTH ASSISTANT ENGINEER**

(Draughtsman) (Civil).

Applicants should have had a recognised technical training and experience in the design and detailing of new buildings and in the conversion of existing buildings.

Experience in the preparation of bills of quantities and estimates and the ability to design simple reinforced concrete and/or steel structures will be an advantage.

Salary N.J.B. Class L, Grade 12 (Scale 8), £1,040/£1,165 per annum.

Applications, together with the names of two referees, should be sent to the Manager, Yorkshire Electricity Board, No. 4 (Leeds) Sub-Area, Bramhope, Nr. Leeds, not later than 23rd December, 1960.

7013

**CONTROL GEAR  
DESIGN ENGINEER**

**A** QUALIFIED Electrical Engineer is required by an established and expanding firm of Electric Motor Control Gear manufacturers.

He should be capable of producing designs for motor control gear components from theoretical considerations, and should have a wide knowledge of contemporary materials and production techniques.

The appointment will carry a salary of not less than £1,750.

Reply in confidence with full details to—Box 6904.

**NATIONAL INSTITUTE FOR RESEARCH  
IN NUCLEAR SCIENCE**

**1. MAINTENANCE SECTION ENGINEER** (Ref. VN16/48) wanted for commissioning maintenance and fault-finding of electrical and electronic components of the new High Energy Particle Accelerator—NIMROD—now under construction at the Rutherford High Energy Laboratory. Experience of control equipment and stabilised power supplies, essential knowledge of high power R.F. equipment and monitoring units an advantage.

**2. SERVICES SECTION ENGINEER** (Ref. VN.22/48) for installation and maintenance of the site H.V. and M.V. distribution network substation and all building electrical services; construction, installation and commissioning of experimental equipment associated with NIMROD. Experience required in installation, commissioning or maintenance of large factory distribution systems, physics laboratory experimental equipment or heavy electrical plant.

**QUALIFICATIONS:** Corporate Membership of I.E.E. or exempting qualifications. Recognised engineering apprenticeship or equivalent.

Salary according to age and experience in range: Post 1 £860—£1,340. Post 2 £860—£1,825. Posts permanent and superannuable.

POST CARD for application forms and further details from

**RECRUITMENT OFFICER****NATIONAL INSTITUTE FOR RESEARCH IN NUCLEAR SCIENCE****HARWELL, BERKS**

quoting ref. number as above

6989

**CENTRAL ELECTRICITY  
GENERATING BOARD****South Eastern Division****Kingston Power Station**

**E**LECTRICAL MAINTENANCE ENGINEER (Vacancy No. 215a/60R). The successful candidate will be responsible for the organisation and efficient working of the Electrical Maintenance Department in a high-merit station. Applicants should have had experience in the maintenance of heavy electrical plant and switchgear and should possess the H.N.C. in Electrical Engineering (Power). Experience in the control of labour is desirable.

The station is pleasantly situated on the banks of the River Thames near a good shopping centre. Good educational facilities are available in the area.

Salary N.J.B. Class G, Grade 6, £1,240—£1,375 per annum including London allowance.

Applications giving age, details of experience, qualifications, etc., and quoting vacancy number, should be sent to the Station Superintendent, Kingston Power Station, Down Hall Road, Kingston-upon-Thames, Surrey, to arrive by 20th December, 1960.

W. H. DUNKLEY,  
Divisional Controller.

7004

**CENTRAL ELECTRICITY  
GENERATING BOARD****Midlands Division**

**A** APPLICATIONS are invited for the post of STATISTICAL ASSISTANT in the Divisional Laboratory situated at Nechells "A" Power Station. The duties associated with this post will include the design and analysis of experimental trials and the preparation and maintenance of quality control charts. Preference will be given to candidates having a knowledge of chemistry, particularly relating to fuels.

Candidates should possess a Statistical Diploma or hold a suitable Degree in Mathematics.

The salary will be in accordance with the N.J.B. Agreement, Schedule B, Class BX, either Grade 7, £1,200—£1,500 per annum, or Grade 6, £1,285—£1,610 per annum, according to qualifications and experience.

Apply, quoting Vacancy No. 333/60MD, to the Establishments Officer, 53, Wake Green Rd., Moseley, Birmingham, 13, by 19th December, 1960.

6977

**CITY AND COUNTY OF  
KINGSTON UPON HULL****City Engineer's Department**

**Appointment of Senior Mechanical & Electrical Engineering Assistant:** Salary A.P.T. V, £1,310/£1,480 (commencing salary according to experience)

**A** APPLICATIONS are invited for the above appointment from Associate Members of the Institution of Civil Engineers, Institution of Mechanical Engineers, or Institution of Electrical Engineers.

Candidates must have had considerable experience in design and maintenance, and be capable of taking charge of a section of the department which is responsible for a continuous programme of mechanical and electrical design and installation works, including high-tension substations, heavy duty pumping plant, electrical generation, mechanical handling, refrigeration, baths, washhouses, refuse disposal plant, heating, ventilating and general engineering.

Housing accommodation will be made available for the successful married candidate not already resident within the city.

Consideration will be given to a contribution towards removal expenses.

Applications on forms to be obtained from the City Engineer, Guildhall, Kingston upon Hull, are to be returned not later than 23rd December, 1960.

WM. MORRIS, O.B.E.,  
City Engineer.  
Guildhall,  
Kingston upon Hull.

6968

**TRINIDAD AND TOBAGO  
ELECTRICITY COMMISSION**

**W**EST INDIAN ENGINEERS who are interested in careers with the Trinidad and Tobago Electricity Commission are invited to write to the Secretary, P.O. Box 121, Port-of-Spain, Trinidad, West Indies. There are good opportunities for young West Indian Nationals with Degrees in Electrical Engineering or who hold Higher National Certificates in Electrical Engineering or who are Graduate Members of the Institution of Electrical Engineers. Commencing salary £1,050 per annum. Experience not necessary but candidates **MUST** be qualified.

6922



## EASTERN ELECTRICITY BOARD

**A**PPPLICATIONS are invited for the following appointments. The successful candidates will be required to contribute to a superannuation scheme and may be required to undergo a medical examination.

## Chilterns Sub-Area

HEMEL HEMPSTEAD DISTRICT  
(319/60.R)

**TWO FOURTH ASSISTANT ENGINEERS.** Candidates should have had a sound technical training and suitable experience in the construction, operation and maintenance of H.V. and L.V. overhead and underground distribution systems, including substations.

Salary N.J.B. Class F, Grade 11 (£765-£870).

Apply by letter to the Manager, Hemel Hempstead District, Eastern Electricity Board, Bridge Street, Hemel Hempstead, Herts., by 23rd December, 1960.

LUTON DISTRICT  
(320/60.R)

**SENIOR DEMONSTRATOR.** Candidates should hold the E.A.W. Diploma. Experience in the organisation of public demonstrations and lecturing on domestic electrical subjects, together with proved sales ability, preferably with direct experience in the sale of all types of domestic apparatus, is essential.

Salary N.J.C. Grade 2 (£700/£775).

Apply by letter to the Manager, Luton District, Eastern Electricity Board, 487, Dunstable Road, Luton, by 23rd December, 1960.

## Northmet Sub-Area

## EDMONTON DISTRICT

(a) SECOND ASSISTANT ENGINEER  
(Ref. 1021) (321/60.R).(b) THIRD ASSISTANT ENGINEER  
(Ref. 988) (322/60.R).

For post (a) candidates should have had a sound technical training and considerable experience in the construction, operation and maintenance of underground distribution systems at voltages up to and including 33 kV.

For post (b) candidates should have had a sound technical training and suitable experience in the construction, operation and maintenance of H.V. and L.V. distribution systems including substations. Suitable accommodation is available comprising a two-bedroomed self-contained flat for post (b).

Salary N.J.B. Class F:—

(a) Grade 7 (£1,040-£1,165) plus London allowance.

(b) Grade 9 (£890-£1,015) plus London allowance.

For these posts apply by letter to C. A. Baker, B.Sc.(Eng.) Lond., M.I.E.E., Manager, Eastern Electricity Board, 305, Fore Street, Edmonton, London, N.9, by 19th December, 1960. 7007

CENTRAL ELECTRICITY  
GENERATING BOARD

## South Wales Division

**A**PPPLICATIONS invited for the following superannuable N.J.B. appointments.

## ASSISTANT ENGINEERS

(Plant Control and Efficiency),

ABERTHAW POWER STATION,

THE LEYS, NR. BARRY, GLAM.

(Vacancy No. 323/ER/60).

Salary Schedule A, Class L, Grade 10, Scale 10, £1,190-£1,325 per annum, plus 10% shift enhancement.

Applicants should possess H.N.C. or equivalent qualification and have had experience of operation of modern high pressure and temperature unit plant.

FOURTH ASSISTANT ENGINEER,  
TRANSMISSION DEPARTMENT  
(Construction Section),  
DIVISIONAL HEADQUARTERS,  
CARDIFF (Vacancy No. 324/ER/60).

Salary Schedule B, Class AX, Grade 9, Scale 9, £1,005-£1,245 per annum; Grade 10, Scale 8, £935-£1,165 per annum; Grade 11, Scale 7, £855-£1,090 per annum, according to qualifications and experience.

Applicants should possess H.N.C. (Electrical), or equivalent qualification, and have experience in the construction or maintenance of 132 kV substation plant, or overhead lines.

Special application forms obtainable from Secretary, South Wales Division, Central Electricity Generating Board, Twyn-y-fedwen Road, Gabalfa, Cardiff, to be returned by 23rd December, 1960. 7005

ARE YOU ONE OF THE YOUNG  
ELECTRICAL ENGINEERS WHO ARE

Eager to widen their experience.  
Worried because they are becoming too specialised too soon.  
Anxious to make more use of their academic training.

## If so, you can

Obtain a general knowledge and experience of the latest control schemes associated with the most up-to-date industrial applications and particularly schemes concerned with automation projects;  
Discuss in detail the design of these control schemes with the system design engineers responsible for them;  
Gain time to broaden your engineering knowledge before choosing a specialised field, either with us or elsewhere in industry;

by joining the

## METAL INDUSTRIES DIVISION

of the

ENGLISH ELECTRIC  
COMPANY LIMITED

as

## A TECHNICAL AUTHOR

If you wish to learn more about these opportunities please write to Dept. G.P.S., English Electric House, Strand, London, W.C.2, giving details of previous experience and qualifications, and quoting reference ER.1292F.

6959

## SURREY EDUCATION COMMITTEE

Wimbledon Technical College  
Gladstone Road, London, S.W.19

(1) **LECTURER/SENIOR LECTURER** in ELECTRICAL ENGINEERING with special reference to electricity supply. Should be University Graduates and/or Corporate Member of the Institution of Electrical Engineers, with good industrial and teaching experience. Salary Burnham Technical Scale, Lecturer, £1,370 × £35 to £1,550; Senior Lecturer, £1,550 × £50 to £1,750, plus London allowance in each case.

(2) Required 1st September, 1961, **GRADE B ASSISTANT**, with good industrial experience, to teach ELECTRICAL ENGINEERING and MATHEMATICS in Electrical Engineering Department. Should be able to teach O.N.C. subjects to S.3 level and some subjects in either C. and G. Electrical Installation Courses B and C, or C. and G. Telecommunication Technicians Courses B and C. Salary Burnham Technical Scale, £700 × £27 to £1,150, plus London allowance.

Application forms and further particulars obtainable from Principal, to be returned by 23rd December, 1960. 7006

## SOUTH WALES ELECTRICITY BOARD

First Assistant Engineer  
General Assistant Engineer

**A**PPPLICATIONS are invited for the following superannuable posts:—

(a) FIRST ASSISTANT ENGINEER  
(Rhondda District).

Salary N.J.B. Class F, Grade 4, Scale 11 (£1,275-£1,410 per annum).

The successful applicant should have experience in overhead and underground line construction. Preference will be given to engineers possessing the Higher National Certificate in Electrical Engineering.

Applications stating age, present position, present salary, qualifications and experience, should be addressed to C. L. Townsend, Assoc.I.E.E., Manager, Cardiff and East Central Area, 445/447, Cowbridge Road East, Cardiff, to arrive not later than the 28th December, 1960. Please quote reference 217/60/ER endorsing envelope "First Assistant Engineer."

(b) GENERAL ASSISTANT ENGINEER  
(Newport District).

Salary N.J.B. Class G, Grade 11, Scale 5 (£825-£940 per annum).

Preference will be given to engineers possessing the Higher National Certificate in Electrical Engineering.

Applications stating age, present position, present salary, qualifications and experience, should be addressed to D. G. Gwyn, B.Sc., A.M.I.E.E., Manager, Monmouthshire and Mid-Wales Area, Llywelyn Road, Cwmbran, Mon., to arrive not later than the 28th December, 1960. Please quote reference 216/60/ER endorsing envelope "General Assistant Engineer."

R. G. WILLIAMS,  
Secretary.

7017

## UNIVERSITY OF SOUTHAMPTON

## Department of Electrical Engineering

**A**PPPLICATIONS are invited for the post of **LECTURER** or **ASSISTANT LECTURER** in Electrical Engineering. Salary scales: Lecturer £1,050 × £50 to £1,400 × £75 to £1,850, with an efficiency bar at £1,475; Assistant Lecturer £800 × £50 to £950. The initial salary will depend on qualifications and experience.

Further particulars should be obtained from the Secretary and Registrar, to whom applications (7 copies from United Kingdom applicants) should be sent not later than 31st January, 1961. 6994

LARGE ELECTRICAL  
CONTRACTORS

require

## CONTRACTS MANAGER

**T**HE successful applicant will be responsible for all aspects of contract organisation and execution and should have drive, initiative and a thorough training in electrical contracting.

A salary of between £1,500 and £1,700 is envisaged and a car or car allowance will be provided. This is a superannuated position in a company having a large expansion programme before them.

Applications, which will be treated in the strictest confidence, should be in writing, stating age, experience, qualifications and present salary, to—

Box 7012



## Situations Vacant (continued)

### BAHAMAS ELECTRICITY CORPORATION

Applications are invited for the post of

### DEPUTY GENERAL MANAGER

with the Bahamas Electricity Corporation in Nassau.

Applicants should be Corporate Members of the Institution of Electrical Engineers or the Institution of Mechanical Engineers and have practical experience in the long-term planning associated with an electricity supply system. A knowledge of diesel plant operation would be an advantage.

The contract will be for a period of three years with a possibility of renewal or permanent appointment.

Salary will be £3,000 per annum.

Official housing is not available, but a rent allowance will be paid equal to £95 per month less 15% of the officer's monthly salary.

First class return air passages will be provided for the officer and his wife and family up to a maximum of three adult fares.

Upon satisfactory completion of the contract the persons engaged will be entitled to 28 days' full pay leave for each year of service, and in addition a gratuity equal to 10% of his annual salary for each year of completed service.

In addition, two weeks' local leave may be granted annually at the discretion of the General Manager.

There is at present no income tax in the Bahamas.

The successful applicant will be provided with an official car.

Applications should be sent in the first instance by air mail to the General Manager, Bahamas Electricity Corporation, c/o General Post Office, Nassau, Bahamas. Closing date for applications will be 20th December, 1960.

6921

### TRANSFORMER SALES AND CONTRACTS

**E**NGINEER required for preparing estimates, composing tenders and for technical correspondence with the minimum of supervision. Applicants should preferably have H.N.C. and experience in this field.

Apply :-

Sales Director  
**BRYCE ELECTRIC CONSTRUCTION  
CO. LTD.**

Kelvin Works, Hackbridge, Surrey

6916

### TRANSFORMERS & RECTIFIERS LTD.

Millmead, Guildford, Surrey  
require

DESIGN ENGINEERS  
TEST ENGINEERS  
DRAUGHTSMEN

The company is expanding and shortly moving to new and larger premises. Good salary and excellent prospects. Housing assistance possible for the right men.

7010

### ELECTROLYTIC ZINC COMPANY OF AUSTRALASIA LIMITED

Risdon Works, Hobart, Tasmania

Electrical Engineering Assistants

**C**OMMENCING SALARY RANGE at the rate of £A.1,425 - £A.1,650 per annum (depending upon qualifications and experience), giving **ESTIMATED TOTAL REMUNERATION**, £A.1,650 - £A.1,900 per annum (including bonus at 1959 value).

The bonus mentioned above is paid half-yearly and is based upon the dividend rate declared by the company.

**QUALIFICATIONS.** Recent graduates or diplo-mates in electrical engineering or in engineering having majored in power electrical engineering, those who expect to so qualify at the end of the present academic year or who hold equivalent qualifications.

**PLANT.** Risdon Works is a large electro-chemical plant.

Total employees approximately 2,850 (electrical engineering department 350).

Average power demand, 85 mW (114,000 h.p.). Installed electrical equipment includes rotary converters (46 mW), mercury-arc rectifiers (21 mW), germanium rectifiers (15 mW), twelve 11-kV/415-v. substations, with H.V. and L.V. distribution systems, some 2,500 motors and a variety of other industrial equipment.

Electrical engineering department is responsible for all electrical design, construction, operation and maintenance.

Projected work includes replacement of rotary converters with rectifiers, extension of substation and distribution systems and continuing installation of new plant.

**HOUSING.** A house or flat could be made available to a married man.

**APPLICATIONS** to be addressed to the General Superintendent, Electrolytic Zinc Co. of Australasia Ltd., Box 377-D, G.P.O., Hobart, Tasmania.

Copies of references and details as to country of origin, age, marital status, educational qualifications, experience (if any) and date on which duties could be commenced are to be provided. Further information will be supplied on request.

244

### BRADFORD INSTITUTE OF TECHNOLOGY

Department of Electrical Engineering

**A**PPPLICATIONS are invited for the following posts in this rapidly expanding department which offers exceptional opportunities for teaching, consulting and research work :-

**SENIOR LECTURER IN  
ELECTRICAL ENGINEERING.**

Salary scale £1,550 to £1,750.

**LECTURER IN  
ELECTRICAL ENGINEERING.**

Salary scale £1,370 to £1,550.

Candidates should be suitably qualified to teach to final degree standard in electrical power and machines or electronics and telecommunications. Industrial and research experience will be a recommendation.

The successful candidates will be encouraged to develop industrial contacts and undertake research for which adequate facilities will be available.

Previous industrial and research experience at a suitable level will be taken into account in fixing the commencing salary.

Further particulars and forms of application may be obtained from the Registrar, Bradford Institute of Technology, Bradford, 7.

HENRY PATTEN,

Clerk to the Governors.

6997

### ELECTRICAL CONTRACTING ENGINEER

required for West Africa

for service with an electrical contracting company. Applicants must have experience on the preparation of specifications and estimates and supervision of all types of installation work.

Remuneration between £1,400-£1,600 depending on age, qualifications and experience. Family allowances and pension scheme, free passages for employee and family and free furnished accommodation in Africa. Leave every 20 months.

Please write giving full details to—Box 7022.

### The Nuclear Power Group requires ELECTRICAL AND MECHANICAL ENGINEERS

**T**HE Group, now actively engaged on the construction of four major nuclear power stations as well as designs for new plants in the United Kingdom and overseas, invites applications from engineers suitably qualified for the following positions :-

#### Station Auxiliary Electrical Systems

**ONE SENIOR and ONE JUNIOR ELECTRICAL ENGINEER** for the design of the auxiliary power systems for conventional and reactor plant. Candidates should have several years' experience in power station auxiliary electrical systems up to 11 kV, and for the senior position should have a Degree in Electrical Engineering.

#### Reactor Control Systems

**ONE ELECTRICAL ENGINEER** to design reactor control equipment where very high standards of reliability are essential. Candidates should have a Degree in Electrical Engineering and several years' experience on medium-size rotating and static electrical plant. Experience in the design of industrial servo and precision motor control systems would be an advantage.

#### Reactor Core Design

**ONE MECHANICAL ENGINEER** for heat transfer, stress and energy storage calculations associated with graphite in reactor cores. Candidates should have 2-3 years' industrial experience and an Engineering Degree.

#### Burst Fuel Cartridge Detection

**ONE ELECTRICAL or MECHANICAL ENGINEER** for the design of monitoring equipment for the detection of Burst Fuel Cartridges. Candidates should have an Engineering Degree or equivalent qualification and at least 3 years' experience in medium or light precision engineering.

#### Reactor Instrumentation

**ONE INSTRUMENT ENGINEER** for the design of instrumentation schemes for nuclear power stations including comprehensive temperature and neutron flux measuring schemes. Candidates should have several years' industrial instrumentation experience.

The company operates a contributory pension scheme, and assistance with house purchase is given to married men.

Applications, giving full details of age, qualifications and experience, should be addressed to :-

The Personnel Manager  
**THE NUCLEAR POWER GROUP**  
Radbroke Hall, Knutsford, Cheshire  
quoting reference ER/ELEC/16

6984

### POWER PLANT FOREMAN

is required by the

UNITED KINGDOM  
ATOMIC ENERGY AUTHORITY  
AT WINDSCALE AND CALDER  
WORKS  
CUMBERLAND

**POWER PLANT FOREMEN** are responsible, on shift, for the safe and efficient operation of turbo-alternators and associated plant, and E.H.V. and H.V. switchgear and distribution system. Applicants must have served a recognised engineering apprenticeship and should have had experience in the operation of steam plant and electrical plant. Possession of an O.N.C. or equivalent may be an advantage.

Salary within the scale £1,015-£1,160 p.a. Additional payments are made for regular shift work.

Contributory superannuation. Staff housing scheme.

Send **POSTCARD** for application form, quoting reference P/W.69/J7, to: Staff Appointments Officer, U.K.A.E.A., Production Group, Windscale Works, Sellafield, Seascale, Cumberland.

7011



## NORTH EASTERN ELECTRICITY BOARD

APPLICATIONS are invited for the following appointments which are subject to the conditions of the National Joint Board.

## Area Board Headquarters

SENIOR ASSISTANT ENGINEER,  
INDUSTRIAL SECTION,  
CHIEF COMMERCIAL OFFICER'S  
DEPARTMENT.

Applicants should be suitably qualified engineers and must have a wide experience of the industrial application of electricity, be capable of conducting and advising on negotiations for industrial supplies including preparation of special agreements, and have a sound knowledge of the economics of electricity supply, tariff structure and distribution engineering. Previous experience in the electricity supply industry and a knowledge of the economics of works generation in the steel and chemical industries are desirable.

Salary Schedule B, Class AX, Grade 1, £1,825/£2,085.

## York Sub-Area

THIRD ASSISTANT ENGINEER

(Operation and Maintenance),

SUB-AREA HEADQUARTERS, YORK.

The duties entail the maintenance of radio, telephone and supervisory equipment and assisting with the maintenance and testing of system protection equipment.

Salary Schedule A, Class H, Grade 10, £965/£1,090.

## Harrogate Sub-Area

SENIOR ASSISTANT ENGINEER,  
SUB-AREA COMMERCIAL OFFICER'S  
DEPARTMENT,  
SUB-AREA HEADQUARTERS,  
HARROGATE.

Applicants should have had experience of commercial practice and distribution in electricity supply, including development work in urban and rural areas.

Salary Schedule A, Class G, Grade 4, £1,350/£1,500.

Applications stating age, qualifications and experience to be received by Assistant Secretary (Establishments), North Eastern Electricity Board, G.P.O. Box No. 117, Carlisle House, Newcastle upon Tyne, within ten days of the appearance of this advertisement. 7020

## DEPUTY ENGINEERING MANAGER

DEPUTY ENGINEERING MANAGER required for GHANA by leading British merchant house. To be a fully qualified Electrical Engineer with commercial and practical experience overseas in a wide range of electrical equipment, and to act as Deputy to Ghana Engineering Manager. Preferably under 36 years of age.

Commencing salary £1,400/£1,600, depending on experience, plus commission, free partly furnished accommodation, provident fund, etc.

Full personal particulars and experience to—Box 7008.

## NORTH WESTERN ELECTRICITY BOARD

Fourth Assistant Engineer,  
Clayton Testing Station,  
Sub-Area Engineering Department

APPLICATIONS should have experience in the testing of all types of protective equipment including associated control and other gear. Preference will be given to applicants who hold the H.N.C. in Electrical Engineering.

Salary scale £965 × £25 to £1,090 p.a., Grade L.13. N.J.B. conditions.

Applications on forms to be obtained from the Manager, No. 5 Sub-Area, North Western Electricity Board, Jubilee Street, Blackburn, and returned to him by 21st December, 1960. 6991

# ENGLISH ELECTRIC

## CONTROL ENGINEERS

THE continued expansion of large sectors of the British industry depends on the right electrical control equipment being available. There is an ever-increasing demand for this equipment and the Company requires Control Engineers to undertake the design of control schemes for heavy industrial processes. Particularly for drive systems in the steel industry.

The work involves the design of detailed control schemes for a wide variety of processes and is mainly associated with closed loop control systems using magnetic and transistor amplifiers. Development work covers the design of static switching schemes—using magnetic and transistor elements—for complex automatic control systems. Successful applicants will be joining a leading team of engineers in this field and the work will appeal particularly to young engineers between the ages of 25 and 30, who enjoy meeting people and selling technical ideas, while at the same time doing a job requiring high technical ability. Many projects involve travelling to various parts of the United Kingdom or overseas.

Minimum qualifications required are Graduate Membership of I.E.E. or I.Mech.E.

Write giving full details of age, qualifications and experience to Dept. G.P.S., English Electric House, Strand, London, W.C.2, quoting reference ER.1296K.

6960

## SOUTH EASTERN ELECTRICITY BOARD

ASSISTANT DISTRICT ENGINEER,  
Eastbourne District.

Salary £1,040-£1,165 under N.J.B. Class F, Grade 7. Preference given to applicants with technical qualifications up to H.N.C. standard and with practical experience of the planning, construction, operation and maintenance of M.V. and 11 kV underground and overhead systems. The successful applicant will be required to undertake standby duties.

Applications quoting ER and naming two referees on forms from District Manager, SEEBOARD, Electric House, Grove Road, Eastbourne, by 21st December, 1960.

FITTER (Electrical), East Sussex and S.W. Kent.

Wages 5s. 6½d. per hour for 44-hour, 5-day week under N.J.I.C. agreement. The successful applicant will be based on the workshop at Eastbourne, but the duties will chiefly comprise erection and maintenance of switchgear and transformers in major substations in all parts of the Sub-Area.

Applications quoting ER and naming two referees, to East Sussex and S.W. Kent Manager, SEEBOARD, "Westlords," Willingdon Road, Eastbourne, by 21st December, 1960.

DISTRICT CHIEF CLERK, Hastings District.

Salary £1,250 × £35 to £1,355 per annum under N.J.C. Agreement, Grade 7. Applications are invited for the above position which will become vacant in a few months' time on the retirement of the present holder. Applicants must have had a wide practical knowledge of all aspects of the clerical departments of a district. They should be experienced in the control of staff and be capable organisers. Possession of a professional qualification desirable. The successful applicant may have the opportunity of working alongside his predecessor for a time before the latter's retirement.

Applications quoting ER and naming two referees to District Manager, SEEBOARD, 12/13, York Buildings, Hastings, by 21st December, 1960.

GEORGE WRAY,  
Secretary.  
7019

## ELECTRICAL TRADE COUNTER AND STORES ASSISTANT

required for East London wholesaler; must be experienced.—Telephone ROYal 5905. 6996

## CENTRAL LONDON ELECTRICAL WHOLESALE

with rapidly expanding business requires the following staff immediately:—

- (A) SALES OFFICE MANAGER.
- (B) TWO (2) TELEPHONE ORDER CLERKS (Sales).
- (C) PROGRESS & PURCHASING ORDER CLERK.
- (D) STOCK RECORDS CLERK.
- (E) CHIEF STOREKEEPER.
- (F) ASSISTANT STOREKEEPER.
- (G) PACKER.

Experience essential, progressive positions. Please write in strict confidence full details with age and salary required.—Box 6950.

## TECHNICAL REPRESENTATIVES for INDUSTRIAL ELECTRICAL PRODUCTS

DUE to expansion a prominent international manufacturing organisation has vacancies as follows:—

Bedfordshire, Herts., Middlesex  
and N.W., W.1 and W.C. postal districts  
of London

Since appointments to our staff are made from our field sales force we require men with executive potential in the 25 to 35 year age group, who have experience in sales to the electrical manufacturing industry. Our established lines of electrical insulating products are used by electricity boards and electrical contractors, in addition to electrical manufacturers.

Successful applicants must possess qualifications in electrical or mechanical engineering, preferably with H.N.C. or university training, but the equivalent in practical experience will be considered. An attractive starting salary and incentive bonus scheme is offered, with generous allowances, a company car, and pension and life assurance schemes.

Complete details of education, experience, earnings and age should be sent to Box DL6831, c/o Whites Ltd., 72, Fleet Street, London, E.C.4.

7016



## Situations Vacant (continued)

**SALES ENGINEER**

for London and Home Counties

APPLICATIONS invited from candidates of H.N.C. standard or equivalent with previous sales experience of Rotary Electrical Equipment.

This is a senior appointment and pensionable. Company car provided.

Write giving full details to:—

Personnel Manager

**SMALL ELECTRIC MOTORS LTD.**  
Churchfields Road, Beckenham, Kent

6987

**CAMBORNE SCHOOL OF  
METALLIFEROUS MINING  
CAMBORNE, CORNWALL**

ASSISTANT LECTURER GRADE B to teach Electrical Engineering and associated subjects.

Qualifications: Degree in Engineering or Physics, or Professional qualification in Electrical Engineering, with mining, industrial or teaching experience for which increments will be allowed.

Salary £700-£1,150 × £27 10s., plus qualification allowance on Burnham Scale. Facilities for research.

Apply to the Secretary, who will be pleased to supply further information; state when available. 7021

**DRAUGHTSMAN**

SHELL-MEX AND B.P. LIMITED

require for the Engineering Department of their London Office one DRAUGHTSMAN (Electrical) to assist in the design of lighting, heating and power services in large installations. Some experience in automatic control gear an advantage.

Salary according to experience. Excellent working conditions, staff restaurant, sports club, etc.

Apply in writing giving full details of age, qualifications and experience to:—

The Staff Manager (Ref. CA/129)  
**SHELL-MEX AND B.P. LTD.**  
Shell-Mex House, Strand, London, W.C.2

7009

**HAMPSHIRE COUNTY COUNCIL**

ASSISTANT ELECTRICAL ENGINEER, A.P.T. III (£960-£1,140) required for pensionable post in County Architect's Department. Candidates must possess the Higher National Certificate in Electrical Engineering or be otherwise suitably qualified, and have had considerable experience in the design of electrical installations in schools and public buildings, preferably in the office of a local authority. Separation allowance and assistance with removal expenses in approved cases. Five-day week, canteen facilities.

Application forms, returnable by 21st December, 1960, from the Clerk of the County Council, The Castle, Winchester. 6993

**ELECTRICAL AND  
MECHANICAL  
DRAUGHTSMEN**

EXPERIENCED Electrical and Mechanical Draughtsmen required for H.T. and L.T. Switchgear Contracts Drawing Office. Rates in excess of recognised published minimums for men with right experience.

Apply:—

Personnel Manager  
**SOUTH WALES SWITCHGEAR LTD.**  
Blackwood, Mon.

6889

**CENTRAL ELECTRICITY  
GENERATING BOARD**

South Western Division

SHIFT CONTROL ENGINEER (Vacancy No. ER./AV/174/60) required at Newton Abbot Power Station.

Superannuation scheme. Salary N.J.B. Class F, Grade 10, Scale 5, £825-£940 per annum, plus 10% shift allowance (minimum £90 p.a.).

Candidates should possess good qualifications and have had training and experience in the control and operation of steam generating plant and main switchgear.

Previous applicants need not re-apply.

Applications on form A.E.6/ACT obtainable from the Divisional Secretary, 26, Oakfield Road, Bristol, 8, should be completed, quoting vacancy number, and returned by 19th December, 1960. 7014

ASSISTANT electrical development engineer. Vacancy January. State age and qualifications. Preference given to applicant with O.N.C. or H.N.C. Salary commensurate with experience and ability.—Box 7026.

ASSISTANT maintenance engineer (electrical), Misc. V (£685-£760, plus London weighting) required at Poplar Town Hall, 42-hour week, variable hours of duty including Saturdays and Sundays as required, overtime and allowances payable. Form of application obtainable from Borough Engineer and Surveyor, Poplar Town Hall, Bow Road, London, E.3. Closing date 31st December, 1960. 7029

CABLE jointers and mates required for long term contract work in the South Wales area. Jointers must be capable of working up to 11 kV and live L.V. mains. Generous overtime. London rates. Please reply to—Box 6877.

CROMPTON PARKINSON Ltd. have a vacancy for a senior draughtsman at their transformer works, Hayes, Middx. Applicants should have previous experience on large power transformers. Write stating details of education, experience, age and salary required to Personnel Officer, B.E.T. Co. Ltd., Clayton Road, Hayes, Middx. 7000

DEVELOPMENT engineer and assistant; engineer to take charge of a heater development laboratory, after a short initial period. Able to see design through from inception to quantity production with minimum supervision. O.N.C. (Electrical) minimum, but a higher qualification is desirable, together with some years' practical experience of small appliances and a sound knowledge of elementary physics. Assistant O.N.C. standard. Send details of qualifications, experience, positions held, present salary, etc., to the Personnel Manager, E.K. Cole Ltd., Malmesbury, Wilts. 6821

DRAUGHTSMAN, electrical, with experience of A.C. and D.C. automatic motor control gear. Altrincham district. State qualifications and salary required.—Box 7001.

DRAUGHTSMAN or junior with experience of transformers up to 1,000 kVA required by expanding company in the London area. State experience, qualifications, age and present salary. Own staff informed.—Box 6835.

DRAUGHTSMAN. Young man required by established elec. contractors in Westminster area. Some experience in preparation of electrical installation schemes essential. Write age, exp. and salary.—Box 7002.

ELECTRICAL breakdown man required in January. Minimum rate 6s. 6½d. per hour plus 4-room flat accommodation in North London.—Box 188.

ELECTRICAL engineer with industrial contracting experience required to take charge of the electrical installation, maintenance, and plant development work of a group of factories in the Manchester area. Minimum qualifications H.N.C. (Electrical) or equivalent.—Box 7027.

ELECTRICAL engineering assistants. Two men with initiative required. Age 25 to 40, of good general education and up to H.N.C. technical standard. Duties to assist in planning extensions and modernisation of electrical plant from intake substations to production unit in a specialised branch of the steel industry in the Midlands. Drawing office experience and some knowledge of industrial electronics an advantage. Salary according to capabilities; four figures considered for the best man. Write in confidence details of training, experience, present duties, qualifications and salary required to Chief Electrical Engineer.—Box 6962.

ELECTRICAL engineer required for Glasgow office staff, age 23-28. Applicants (H.N.C. minimum) should have had experience in the manufacture of electrical machines. Progressive salary with non-contributory pension. Applications stating age, nationality, qualifications and experience to—British Engine Boiler & Electrical Insurance Co. Ltd., 98, West George Street, Glasgow, C.2. 6999

ESTIMATING, site supervising and design engineer required for high-class installation work of all descriptions. Permanency and good immediate prospects for keen and able engineer. Write stating age, experience and salary required to—Mr. C. King, Alliance Electrical, 2, Henrietta Street, London, W.C.2. 137

IN New Year, electrical engineer required, old est. S.W. London contractor. If any young man has qualifications and experience in planning and designing specifications, supervising site and tendering for industrial and commercial installations of all types, will offer generous salary and unlimited scope, plus 5-day week, pension, 3 weeks' holiday, etc.—Box 6963.

INSTRUMENT makers required, fully skilled and able to work to drawings and specifications. Apply quoting ref. FD/527/1, to Personnel Officer, Decca Radar Limited, Shannon Corner, New Malden, Surrey. 7024

JOINTERS (E.H.T.) required, must be experienced in all classes of jointing work up to 11 kV. Present rate of pay 5s. 6½d. per hour. N.J.I.C. conditions, including 42-hour 5-day week. Holiday and sick pay schemes, optional superannuation scheme. Apply by letter to District Manager, Midlands Electricity Board, Windsor Road, Redditch. 6988

REPRESENTATIVE required for a firm of London wholesalers (electrical), experienced and with good connections. Only men who can produce results need apply. This is a unique opportunity for the right man.—Box 6880.

SALES engineer for London, North of Thames, to sell Breeze industrial fans. Applications invited from energetic and enthusiastic candidates with previous sales experience, electrical-mechanical background. Please write to Sales Director, London Fan & Motor Company Ltd., 331, Sandycroft Rd., Richmond, Surrey. 7680

SENIOR electrical draughtsmen required for consulting engineer. Must have varied experience on general electrical installation projects. Good salary, permanency, pension scheme.—C. W. Glover & Partners, Francis House, Francis Street, Victoria, London, S.W.1. 6980

SITE measuring surveyor required for the measurement and evaluation of electrical installations. Applications in writing in the first instance stating age, experience and salary, etc., to—Frank N. Falkner & Partners, Chartered Quantity Surveyors, Windscale Works, Seascale, Cumberland. 7025

SITE supervisors wanted for long term cable installation contract work in the South Wales area. Please reply to—Box 6876.

TECHNICAL assistants are required for experimental work in connection with the manufacture of electric cables and associated manufacturing plant. Applicants should be between the ages of 21 and 26 and preference will be given to those with an engineering degree or professional qualification. Previous knowledge of this interesting type of work is not necessary as training will be given. Opportunities will arise for promotion to more responsible positions. Excellent canteen and welfare facilities. Contributory pension scheme. Please state age, education, subsequent training and salary expected in replying to Personnel Officer, Southern United Telephone Cables Ltd., Dagenham, Essex. 6899

TECHNICAL sales representative required by leading industrial lighting fittings manufacturers for East London, age 24-28, H.N.C. preferred, outside sales experience not essential. Salary, commission and expenses, car provided. Apply in writing to—F. W. Thorpe Limited, Welby Road, Hall Green, Birmingham. 6981

TRANSFORMER test engineer to take charge of test dept. of small progressive company making all types up to 1,000 kVA. Good salary and prospects.—Box 7028.

**APPOINTMENTS FILLED**

Dissatisfaction having so often been expressed that unsuccessful applicants are left in ignorance of the fact that the position applied for has been filled, may we suggest that Advertisers notify us to that effect when they have arrived at a decision? We will then insert a notice free of charge under this heading.



## SITUATIONS WANTED

**B**UYER (43), 14 years' experience purchasing, electrical and mechanical accessories, appliances, plant and packing materials. Qualified engineer, staff control, stock records, etc.—Box 7685.

**C**ONTRACTS engineer available; 30 yrs. experience; sound business introductions all branches.—Box 7679.

**G**ENERAL manager. Chartered electrical engineer with several years' senior responsibility in light/medium manufacturing fields will shortly be available. London area preferred but would consider unit overseas.—Box 7682.

**I**NSTALLATIONS engineer (48), supervision, planning and complete handling of all types of installations. Resident Middlesex; willing to travel.—Box 7678.

**T**ECHNICAL sales development engineer (49), resident East Anglia, desires change to progressive company. Experienced liaison work and negotiation at director/chief engineer level. Good standing with board, industry and municipalities.—Box 7684.

## SALES BY AUCTION

By Order of the Under Secretary of State for War

DEVIZES, WILTSHIRE



SALE BY AUCTION OF

GOVERNMENT SURPLUS MACHINE TOOLS, CLOTHING AND EQUIPMENT

including Lathes; Horizontal milling machine; Grinding and drilling machines; Valve refacing machines; Welding plant; Electric travelling hoist; Charging plant; Generators; Lifting gear; Winches; Water sterilisers; Accelerators; M.T. spares; Paint spraying machines; Paint; Electric cable; Stores and equipment; Protective wax spraying solution; Tool kits; Hand tools; Tar-paulin covers; Canvas; Bedding; Greatcoats; Drawers; Shirts; Portable cooking stoves; Motor mowers; Tables; Chairs; Furniture; Mirrors; Cutlery; Crockery; Kitchen utensils, etc.

Lying at:—

DEVIZES  
WEYHILL  
TIDWORTH  
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BRAMLEY, HANTS

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THE CORN EXCHANGE, DEVIZES

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(Tel. 5151/2)

and

130, High Street, Marlborough (Tel. 41)

Catalogue, price 1s., from the above Auctioneers. 6964

## ARTICLES FOR SALE

## MOTORS

**N**EW CROMPTON PARKINSON, from ½ h.p. to 80 h.p.; also 6,000 A.C. and D.C. reconditioned Motors and Starters.

IN STOCK HERE

B. E. WHITE

Brantwood Rd., Tottenham, London, N.17  
Tel. EDMonton 4621-2 215

## HOUSE SERVICE METERS

**200**—240-v. A.C. or D.C., 10 amps. capacity, quarterly type, from 25s. each, plus 2s. 6d. carr.

UNIVERSAL ELECTRICAL CO.  
221, City Road, London, E.C.1 37

**A.A. ELECTRICAL Co. for A.C. - D.C.** motors, switchgear, exhaust fans, hoists, reduction gears, new or reconditioned units.—CHI. 5105. 67, Rothschild Rd. London W4. 57

**A**BACOCK & Wilcox water tube boiler will cut down your fuel costs; we can supply from stock. Two 40,000 lb. evap., 220 lb. w.p.; one 25,000 lb. evap., 200 lb. w.p.; 3,000 lb. evap., 400 lb. w.p.; Spencer Bonecourt boiler; also Marine, Cornish, vertical, etc.—Burford, Taylor & Co. Ltd., Boiler Specialists, Burtayco House, Church Street, Middlesbrough (Tel. Middlesbrough 2622). 122

**A.C. and D.C. motors, generators, from** stock.—Service Electric Co. Ltd., Honeyport Lane, Stanmore, Middx. (Edgware 5566/9). 91

**A.C. and D.C. 1/- slotmeters. Guaranteed 2** years, 2½-50 amps. From 55/-. Repairs and recalibrations. See Billiard: Tradex Meter Co., Surbiton (Tel. Elmbridge 2234/5/6). 169

**ALTERNATORS and generators, all types** up to 150 kW.—Powerco Ltd., 312, York Road, London, S.W.18 (VAN. 5234). 151

**ALTERNATORS for sale from 1,100 kVA at** 750 r.p.m. down to ½ kVA. Single and three-phase. All voltages. More than 150 machines in stock. Automatic regulators and switchboards available.—Fyfe, Wilson & Co. Ltd., Station Works, Bishop's Stortford. 162

**ALTERNATORS, 3-phase, all sizes in stock** from 7 kVA up to 330 kVA.—Britannia Manufacturing Co. Ltd., 22/26, Britannia Walk, London, N.1 (CLERKENWELL 5512). 24

**BARGAINS in electric motors from A. Cooks-**ley & Co. Ltd., 21/25, Tabernacle Street, London, E.C.2. Ring Monarch 3355. 50

**BILLIARD METERS. 1/-, 6d. or 1d. slot.** All time settings. From 170/-. See Quarterly.—Tradex, Surbiton. 170

**CABLE, underground, all types ex stock.**—E. M. Tatton & Co. Ltd., Kew Bridge, Brentford (ISLEWORTH 4534/5). 117

**CABLE, underground, PILC/VIR/LC, ex** London stock. Cutting orders same day delivery London area. Send for priced stock lists.—Batt Electrical Co., 6, Dock Street, London, E.1 (Tel. ROYAL 5905). 316

**CIRCUIT-breakers, various sizes in stock,** A.C. and D.C., 200 amperes up to 2,000 amperes. Also dynamo and alternator switchboards.—Britannia Manufacturing Co. Ltd., 22/26, Britannia Walk, London, N.1. 26

**CONVERTERS, motor-alternators, motor-**generators, frequency changers, etc. All types up to 100 kW.—Powerco Ltd., 312, York Rd., London, S.W.18 (VAN. 5234). 150

**CRANE motors. Direct current, series wound** or compound wound, all voltages. We have large stocks.—Britannia Manufacturing Co. Ltd., 22/26, Britannia Walk, London, N.1. 22

**DIESEL generating sets, all sizes to 500 kW.** Britannia Mfg. Co. Ltd., Britannia Walk, London, N.1. 16

**ELECTRIC motors and generating equip-**ment.—E. M. Tatton & Co. Ltd., Kew Bridge, Brentford (ISLEWORTH 4534/5). 116

**ELECTRIC motors, dynamos, alternators and** motor generator sets of all sizes. We hold one of the largest stocks in England. New and reconditioned, with 12 months' guarantee.—Britannia Manufacturing Co. Ltd., Britannia Walk, London, N.1 (Clerkenwell 5512, 3 lines); also Works and Stores, Chobham, Surrey. 20

**ELECTRIC motors, generators, motor gener-**ator sets, transformers, switchgear, etc., large comprehensive stock, overhauled and guaranteed. Copy of our Register, "Electrical Surplus," containing thousands of items of electrical plant, sent on request.—R. F. Winder Ltd., Belgrave Electrical Works, Leeds, 2. 54

**ELECTRIC motors, 1,000 in stock, half** maker's prices.—Sugduns, Glenly Road, Barking (RIPPLEWAY 3302). 7613

**FLUORESCENT tubes reconditioned and** guaranteed with a life as new for 7s. 6d. each. Free collection and delivery in Lancs. and Yorks. Save 40% on your tube replacement costs by using this service. We are also manufacturers of top quality fluorescent fittings, trunking systems, control gear and new fluorescent tubes. Generous discounts available.—Anglo-American Electrical Company, Clive Street, Bury (Telephone, Bolton 7251). 212

**FOR sale, good, unused and used machinery,** including electric motors, A.C. and D.C. dynamos, alternators, transformers, diesel and steam electric generating sets, mains failure sets, motor generator and Ward Leonard sets, switchgear, compressors, fans, capacitors, etc.—Fyfe, Wilson & Co. Ltd., Station Works, Bishop's Stortford, Herts (Tel. B.S. 1000/1). 161

**GENERATING sets, portable or stationary,** new and reconditioned, 1 to 100 kW, A.C. and D.C.—Powerco Ltd., 312, York Road, London, S.W.18 (VAN. 5234). 148

**KARDEX, Roneodex and Shannovue cabi-**nets, as new.—F. H. Jolly & Co. Ltd., 289, King St., London, W.6 (RIV. 5381). 202

**LABELS. Engraved laminated plastic labels** for switchboards, etc. Quick service at reasonable prices. Send for price list to—Hereford Watch Co., 13, St. Owen Street, Hereford. 7673

**MOTOR generator sets and converters, all** sizes and voltages from ½ kW up to 500 kW in stock.—Britannia Manufacturing Co. Ltd., 22-26, Britannia Walk, City Road, London, N.1 (Tel. Clerkenwell 5512, 5513 & 5514). 12

**MOTORS and control gear, huge stocks all** types, ½ to 200 h.p.—Ramsbottom & Co. Ltd., Elec. Engineers, Keighley (5444/7). 70

**NAMEPLATES, engraving, diesinking, sten-**cils.—Stilwell & Sons Ltd., 153, Far Gosford Street, Coventry. 108

**PHASE converters, single to three-phase,** several sizes in stock up to 90 h.p., 3-phase loading.—Britannia Mfg. Co. Ltd., Britannia Walk, London, N.1. 29

**PLATING dynamos and motor generator** sets, various sizes from 500 amps. up to 2,000 amps., with A.C. and D.C. motors.—Britannia Manufacturing Co. Ltd., 22/26, Britannia Walk, London, N.1. 15

**POLYPHASE kilowatt hour meters. Available** from stock.—Universal Electrical, 221, City Road, London, E.C.1. 40

**PREPAYMENT 1s. slot house service meters.**—Universal Electrical, 217-221, City Road, London, E.C.1. 36

**PURLEY chokes and ballasts. Our 80-w.** tapped h.p.f. ballast with starter switchholder incorporated is proving itself the most popular unit. Suitable for most fittings, 57s. 6d. each subject.—F. W. Blanshard Ltd. (Dept. ER), Purley, Surrey (Uplands 4818/9). 52

**QUARTERLY credit meters, single and poly-**phase, 2½-100 amps. From 20/-. Also D.C. See Television.—Tradex, Surbiton. 171

**ROTARY converters in stock, all sizes;** enquiries invited.—Universal Electrical, 221, City Road, London, E.C.1. 34

**SMALL BR screws and nuts in steel, brass** and stainless steel, from stock.—Premier Screw & Repetition Co. Ltd., Woodgate, Leicester. 180

**TELEVISION slotmeters and time switches.** Details from: Tradex Meter Co., Surbiton (Elmbridge 2234/5/6). 172

**VENNER time switches, 200-240 v. A.C./**D.C., 10-50 amps., from stock.—Universal Electrical Co., 221, City Rd., London, E.C.1. 38

**WARD Leonard motor generating sets, all** sizes.—Britannia Manufacturing Co. Ltd., 22-26, Britannia Walk, London, N.1 (Tel. Clerkenwell 5512). 10

**£5 reward for genuine information leading** to sale of commercial refrigeration; confidential.—Tel. PRIMrose 7860. 6905

**40**—20-h.p., 950/480-r.p.m. Lancashire T.E. F.C. slipping motor with Igranic automatic control panel giving 2-speed control forward and reverse, 415 volts, 3-phase, 50 cycles. Details from—Dynamo & Motor Repairs, North End Road, Wembley Park, Middx. 90

**108**—kW motor generator by E.C.C., output 57/67 volts, 1,900/1,615 amps. D.C., with 165-h.p. slipping motor, 585 r.p.m., with starter for 400 volts, 3-phase, 50-cycle supply. Two sets available. Details and price with guarantee from—Dynamo & Motor Repairs Ltd., North End Road, Wembley Park, Middx. 88

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**188**—kW motor generator by Crompton Parkinson, output 67/90 volts, 2,440 amps. D.C., with 280-h.p., 580-r.p.m. slipping motor, with starter for 400/440 volts, 3-phase, 50 cycles. Two similar sets available for single or parallel operation with switchgear and meters. Details from—Dynamo & Motor Repairs Ltd., North End Road, Wembley Park, Middx. 89

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## COMPANY MEETINGS

## AERIALITE LIMITED

### Achievements in a Difficult Year

**T**HE 28th Annual General Meeting of Aerialite Limited was held on 1st December at Stalybridge, Mr. L. S. Hargreaves, J.P. (Chairman and Managing Director) presiding.

The following is an extract from his circulated statement:—

In spite of an exceedingly difficult year we have a Statement of Account which shows that during the year we have weathered an anxious time which has affected the whole of the cable business in particular, and latterly the television business as well.

There has been a great deal of press describing the cable price war, and I will not burden you with that again—except to say that the price war is not over, although there has been some slight improvement in the situation. You will have seen a number of cable companies showing losses during the year, but we are pleased to say that we are one of the exceptions. We are still showing a reasonable profit on our whole operation, but in our view a disappointing profit in relation to the turnover which we do and the effort we put into it.

You will appreciate, as I warned last year, that we are operating in an extremely competitive situation and it seems that this is likely to continue for the moment, so that we must be prepared for a continuation of similar conditions for some time, and we are operating with that possibility in mind.

It is unfortunate that during this year we have had still more difficulties to contend with due to the "credit squeeze," which has reduced the television business substantially, and with the highly competitive situation in manufacturing generally it seems that one has to do a very large turnover to achieve a modest profit.

Our Cable Factory at Stalybridge has operated profitably during the year, in spite of the problems mentioned, and our Wythenshawe and Stockport factories, operating as Nettle Accessories Ltd., have increased their profitability during the year, which has helped us as a Group, and shows the wise policy of diversification which we pursued in earlier years. Our Congleton factory is not likely to be as profitable as it has been because of the fall in television sales generally, but we are hoping to gain from new products being developed there, which so far have not been able to give us profit, but which, nevertheless, have reasonable prospects.

Comparing our affairs with those of our competitors, we feel satisfied that we have done something in this difficult year to produce a net profit before taxation of £274,902, which is a reduction of approximately £20,000 as compared with last year. We are proposing a Final Dividend of 34% on the Ordinary Stock in addition to an Interim Dividend of 20% which has already been paid.

We are developing a considerable number of new products in our three Divisions and this can be an expensive business, but we feel we should continue with this expansionist policy, and not let temporary problems cloud our efforts.

We have entered the field of Television and Radio Relay and have joined with T.W.W. Ltd. (Television for Wales and the West) in a company called Wireline Ltd., which will invest in suitable relay companies as opportunities arise. This is a new venture but could become substantial although it is a long-term project which will take some time to develop. We are also joined in a relay management company called Relay Operations Ltd., which company is forming local relay companies and looks very promising at its early start. They have formed a number of local relay companies in which we have an interest.

The report was adopted.

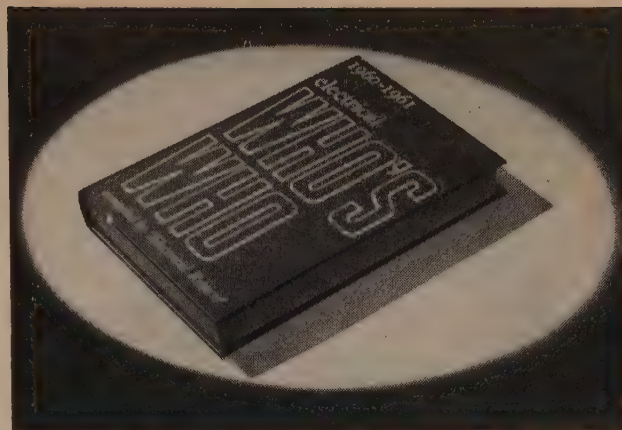
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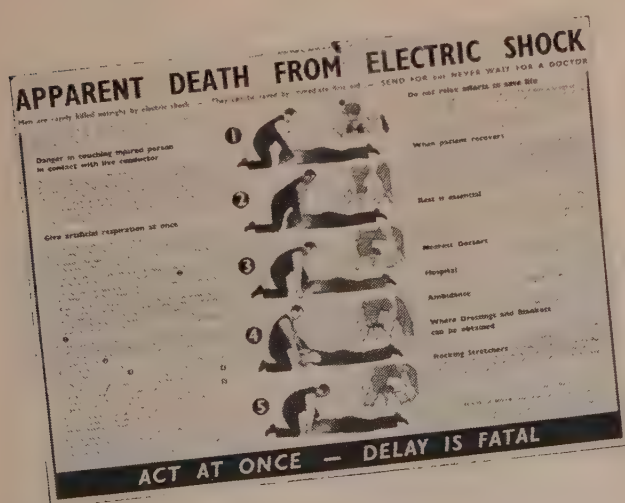
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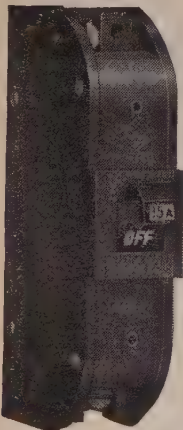
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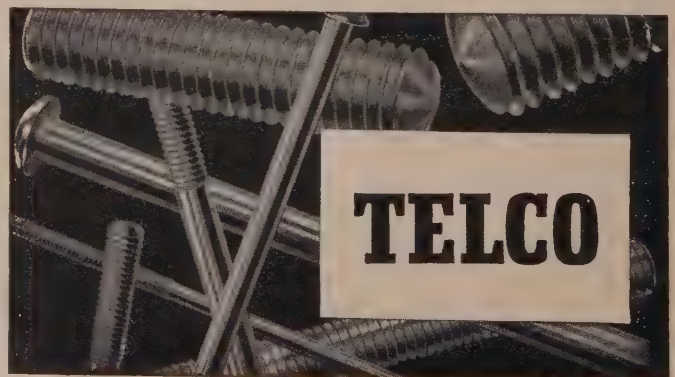
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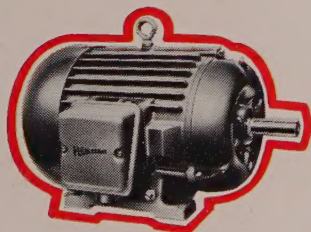
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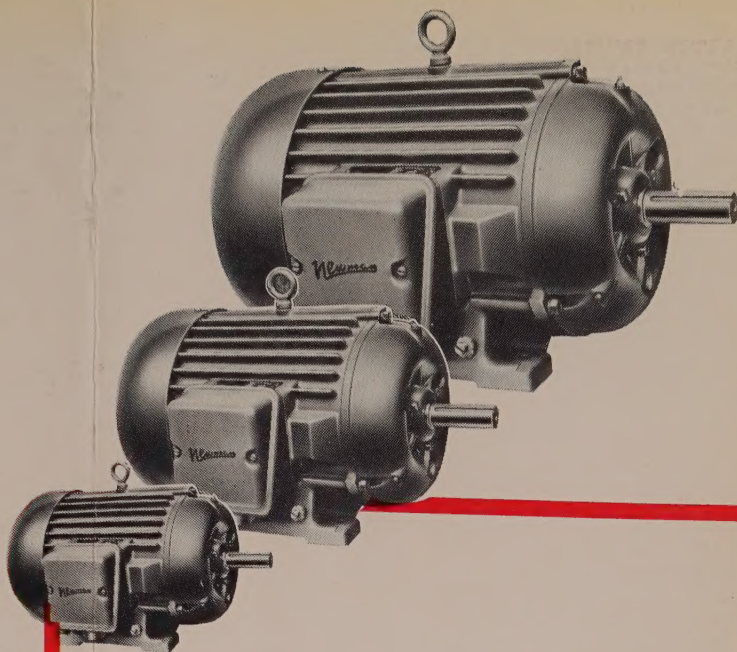


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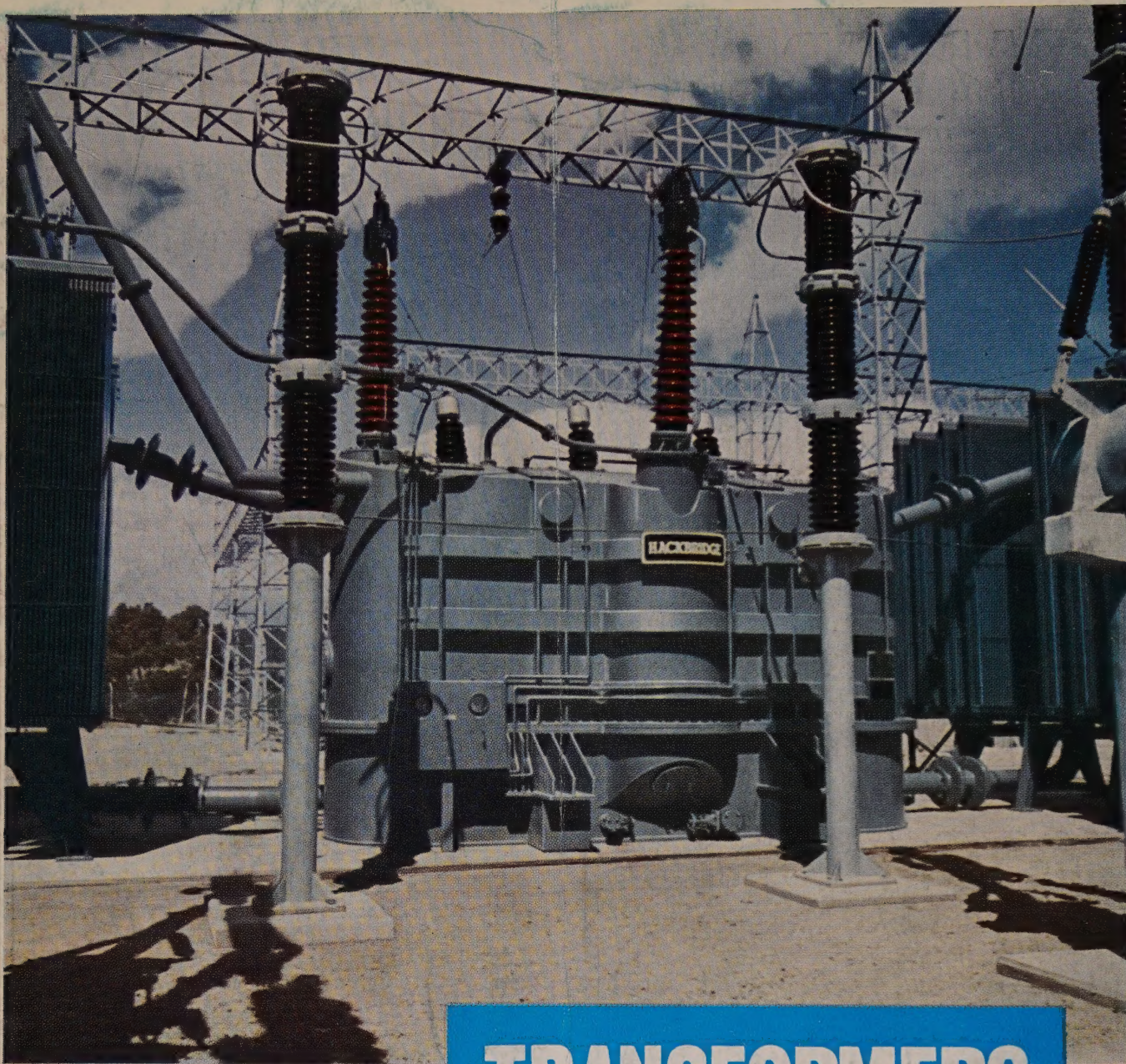
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